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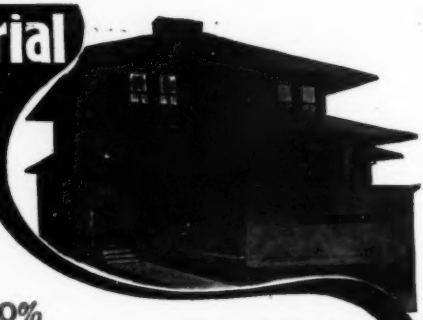

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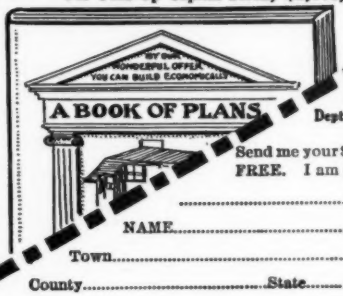

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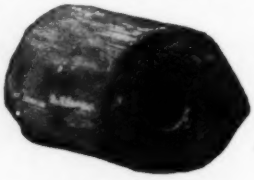

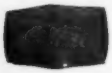

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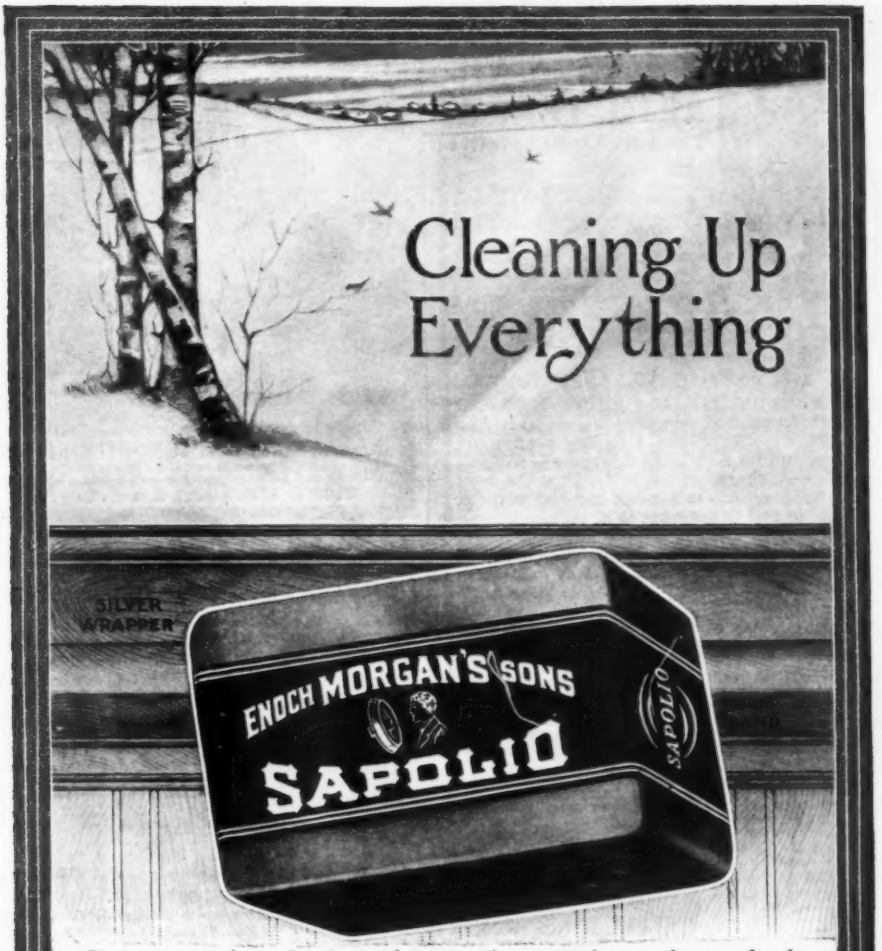

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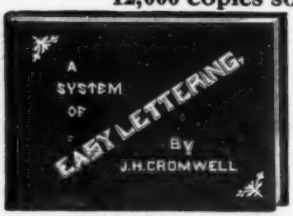

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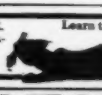

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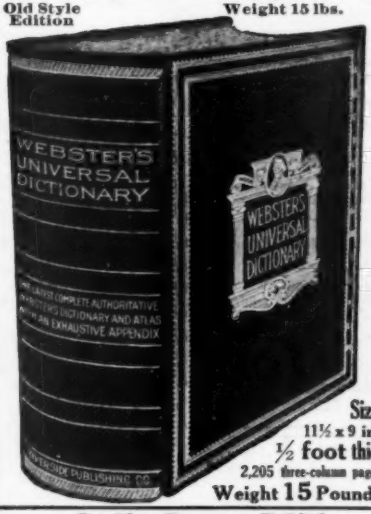

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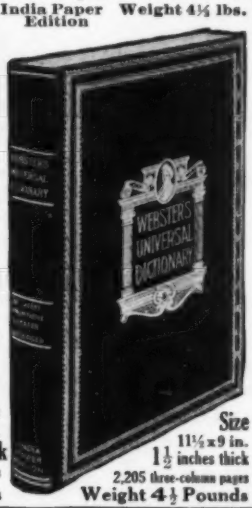

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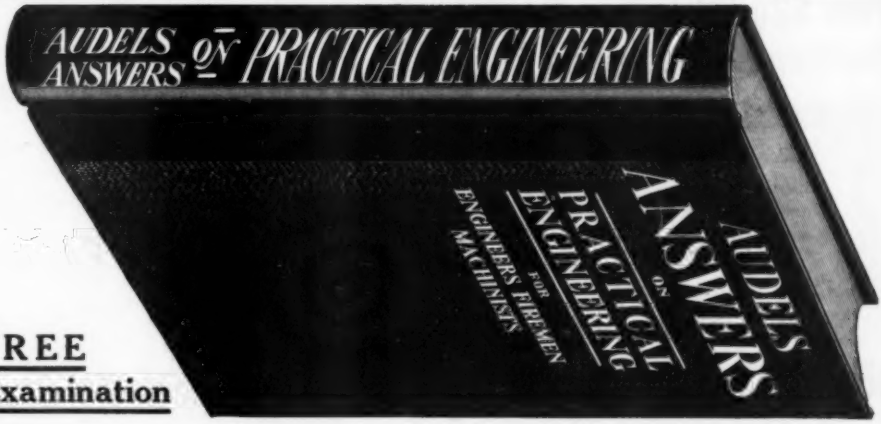

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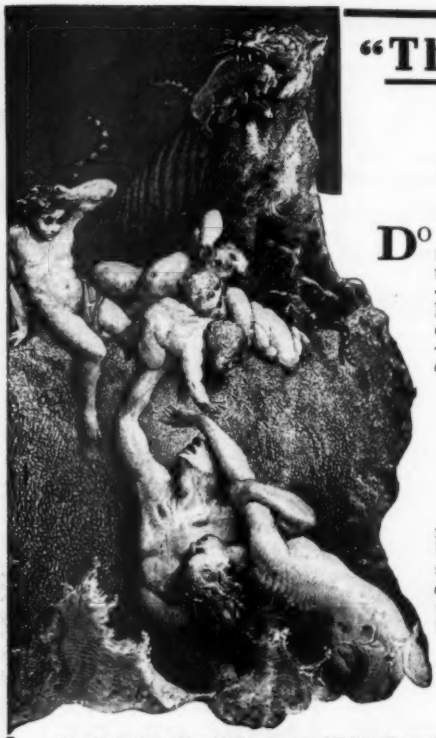

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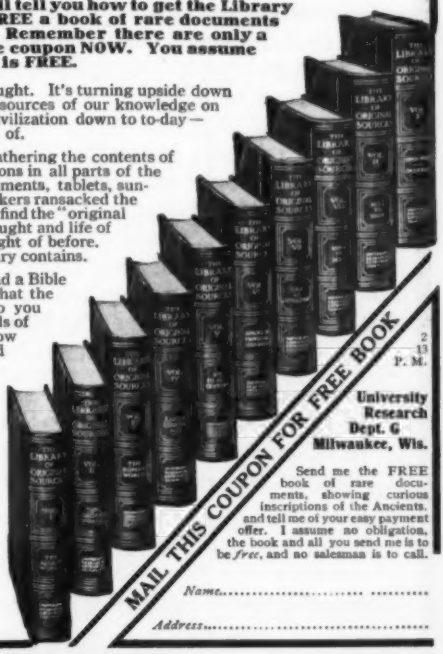

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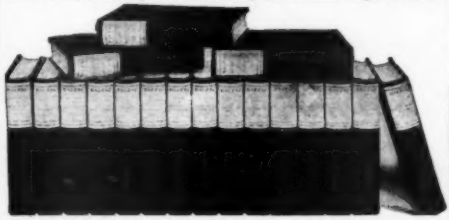

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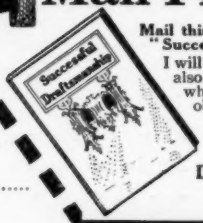

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MAKE More Money! Operate a good substantial Mail Order business—our "Silent Salesman" system—can easily be done in spare time yet the possibilities are unlimited! For years "Booster" has actually and accurately led thousands like you over the Successful Road to Wealth. To succeed you've got to read The Booster Magazine for "Booster" is Opportunity and starts you in business for yourself—tells you how to get the dollars—puts you next to the best money making propositions on earth—ones that really get You the money! Send 10c for two months trial subscription. Booster Magazine, Northwestern Building, Chicago.

MAIL Order Dealers! Advertisers! You need our 1913 Advertising Rate Book with the latest Dollar-making feature "Ads That Pay." Hot from the presses! Gives you cost of Advertising in 2000 recognized magazines and newspapers, location, circulation, closing dates and other useful knowledge. Includes thirty original Mail Order propositions, winners every one of them. A $10,000 investment at your service. You can make a legitimate profit of 95c on every dollar order. This very valuable manual sent prepaid to you for 10c. Write now! Dearborn Advertising Agency, 521 Dearborn St. Chicago.

YOU can make $50 weekly, in spare time, manufacturing Tip-Top the new delicious, pop corn confection—the finest you ever tasted—simply melts in your mouth. No capital or experience required—great opportunity to start a big business of your own and make money easy and quick. Formula and complete directions for manufacturing ten cents silver. U. S. Specialty Co. Dep. 29, New Philadelphia, Ohio.

YOUR opportunity—Become manufacturer. Experience unnecessary, no canvassing. $25 weekly easily earned, at home, during spare time. Sample and particulars free. Delzell Manufacturing Company, 448½ South Mathews, Los Angeles, California.

A Bit Shy on Salary? I pick up $1,500 yearly additional from newspaper correspondence. My book tells what's news, how to get it, where to sell. Newspaper directory included. No correspondence school expense; only 50 cents. Morris White, Station, 50, Detroit, Mich.

? ? CHICAGO Quiz Bureau ? ? 1707 Washington boul., Chicago answers all questions from Chicago, addresses of individuals, firms, or factories, where best to buy—sell—or have articles made. Enclose 25c coin with Query, also special researches made. Saves you Time and Trouble. Try it.

AGENTS wanted: Men or Women now employed to work one hour a day to sell "Clearall." Indispensable for storekeepers, railroads, street car Cos., automobilists, etc. Quick seller. 100% profit. Send 25 cents (coin) for large sample and full details. Northern Laboratories, Chicago.

I WANT You to handle "Successful Brains" and my other Mail Order books—they are the best on earth—millions of copies should be sold on merits alone—fortunes should be made by those who heed their teaching! Write me and I will make it to your advantage to sell these, my newest and best books, by furnishing you circulars and books at the right figure. May I send you confidential Mail Dealers prices? Weissgerber, Northwestern Building, Chicago.

BUSINESS Opportunities for you—with money making methods in Digest you can make $$$. One year subscription only 25c. Digest, Grand Rapids, Mich.

LEARN Auctioneering by correspondence. P. O. Box 72 B, Attica, Ind.

LIVE Wire Mail Order Proposition. You sell Business Houses. No Catch Penny Scheme. R. D. Martin, Plainfield, New Jersey.

SELL your formulas, ideas, plans and knowledge by mail. Some make $1,000 monthly. Instructive booklet for stamp. Information System. 286, Marietta, Ohio.

"THE Art and Process of Dry Cleaning." A fascinating and profitable occupation. 25 cents postpaid. Auburn Supply Co., Dept. EE, 7746 Peoria St., Chicago.

GUARANTEED Remington typewriter free with $1 monthly Typewriting Course. Merit Service, Oshkosh, Wis.

START a formula business, make $50.00 weekly, 50 cents brings complete instructions and 25 best formulas. C. Parker, Box 28, Columbia, Tenn.

USE your spare time to build up a mail order business of your own. We help you start for a share in profits. 27 opportunities. Particulars free. Mutual Opportunities Exchange, Buffalo, N. Y.

RESILVER mirrors and make plenty of money. Full instructions, 25 cents. Auburn Supply Co., Dept. CC, 7746 Peoria St., Chicago.

ANYONE, Anywhere $5 daily replating silverware. Samples free. E. Fiske, 101 Sheffield Ave., Buffalo, N. Y.

SEND me a dollar bill and I will send you manufacturer's recipe for making an article used in nearly every household in America. Can be made by anyone at home. Easily sold. Your profit from 300 to 500%. Business can be started with a few dollars. Your field—the United States. I am proprietor of manufacturing company, also a large business well known in the east. This proposition should make you big money. Your dollar cheerfully returned if not satisfied. C. H. Winkelman, 1833 N. Western Avenue, Los Angeles, Cal.

BE Independent. Make $50' weekly with a New Invention, just patented. 8c profit on every dime. Small investment. Experience unnecessary. Circulars mailed free. International Metal & Ferrotype Company, Dept. B12, Chicago, Ill.

SEND me 25 cents and I will show you one of the best money making plans in existence. Can be operated entirely during spare time. Suitable for men and women. This is no scheme, outfit or instruction school. Send at once and be convinced. B. Lessig, 3859 Coral St., Phila.

YOUR classified ad can be placed in 1,000,000 small town homes at low cost every week. Ask for free Result Checking Book. Use letterhead. Classified Dept., Boyce's Weeklies, 500 Dearborn Ave., Chicago, Ill.

FINISHED and unfinished stock, patterns, tools, etc., for making an improved paperhanger's tool. Exceptional opportunity for mechanic having $150 for immediate investment. Address Box 5, Station G, Southbridge, Mass.

DO you want to own a silver plating business, or manage a shop for half the profits? Instructive pamphlet free; write today. Milliken Co., Davenport, Iowa.

PATENT on draft operating device. Can be retailed complete for six dollars with big profit. $800 cash takes it. No triffers. Victor Cozine, Gloversville, N. Y.

SHEET Bluing, Mending Tissue, Gold Eyed Needles, for Mail Order and Trust Scheme Dealers. Samples Free. Frank Shilling Co., Navarre, Ohio.

I MAKE $3.50 a day at home, spare time, mailing booklets. You can do as well. Booklet explaining all for stamp. John Menihan, 218 S. 4th St., St. Louis, Missouri.

A new business is springing up all over the country. In the New England States hundreds are making big money in the Wet Wash business doing 50 pounds of washing for 50 cents, returning to the housewife washed and extracted. Cost of washing 6 cents; 30 cents profit in a wash. In every household a prospective customer. Small capital needed to begin with for machinery. Write me for particulars. William Johnson, 150 N. Division St., Buffalo, N. Y.

$15 CAPITAL will start you in business as manufacturer's agent. The Family Tooth Powder. Is the greatest tooth cleaning preparation in the world. The retail price for a 4½ oz. bottle is 25c or $3 per doz. You can buy a gross for $15. Leave a dozen at $2 per doz., in 12 drug stores on 60 days' consignment, and after the first few bottles are sold watch it sell itself. Send 25c for a bottle to try, postpaid. Address J. N. Forrest, M. D., D. D. S., San Francisco, California.

TURN your spare time into money. Join us in a profitable mail order business, one that you can operate at home. Large profits; quick returns; small investment. Our 10 years' successful manufacturing experience, personal assistance and new ideas assures you success. Write for positive proof and free booklet. Pease Mfg. Co., Incorporated, 144-148 Broadway, Desk A, Buffalo, N. Y.

MAKE $1 earn $50. Razor Blade Sharpening pays large profits. Easily handled in spare time at practically no expense. Three million owners use four million blades weekly. Big demand for sharpening. Booklet "How to Operate a Sharpening Business" free. What others have done you can do in your town and by mail. Nice money making opportunity for those who apply now. G. A. Haynes, Boston, Massachusetts.

BE first from your locality to represent me and make $1,000.00 to $3,000.00 per year Extra Money. Write today. You will receive a wonderful offer. Edwin Pauley, Erie Bank, Buffalo, New York.

HERE'S Your Chance. $10 starts as clean, legitimate and independent a mail order business as you can put your name to. Indisputable proof, facts and details free on request. Address Expert, 420 Home Bank, Baltimore, Md.

EARN $7 to $12 daily, restoring faded colors in rugs and carpets. Whole or spare time. Original American Process. Great demand. No capital. Full particulars free. Eldred, Dept. 75, Detroit, Michigan.

FREE—For 5c to cover advertising, etc. I'll send, sealed, sample circular and full instructions for operating scheme that brought me $2 an hour. If satisfactory, remit $1; if not, return. Robert Fink, Kane, Penna.

LEARN the truth about Mail Order Business before buying outfits. Valuable information and particulars free. Mail Order Library, P. Tompkinsville, New York.

GUARANTEE anyone $50 weekly from start, without capital. No canvassing. Something new. Better investigate quick. Make your spare time profitable. L. N. Todd & Co., Holladay, Va.

START an anti-fly crusade and make money manufacturing traps. Our plans make success easy. Enclose 10c. A. E. Chapman, Official Fly Catcher, Redlands, California.

MAKE $10 daily restoring colors to faded rugs and carpets. Spare time. Tremendous opportunity everywhere. Simple, easy. Mirror Silvering course free. Free particulars. Coxe, Dept. MD., Omaha, Neb.

FOR Sale—Drug Store on one of the best corners in Louisville, Ky. Exceptional opportunity. For particulars address Crescent, 250 S. Hite Ave., Louisville, Ky.

CONDUCT Paying mail order business from your home. $5 starts business, complete course $1. Particulars free. Box 115 Brooklyn, N. Y.

BE a manufacturer! Big profits. Easily done. Your kitchen will serve as a factory. Sample formula, lists and plans 10c. The Anjo Company, Box 497, Galesburg, Ill.

START a mail order business. Reliable guide tells how, where to buy, 25c. Geo. R. Allen, Bound Brook, New Jersey.

LEARN the "Dry Cleaning" business. Complete instructions 20c. Profitable Service Bureau, 4333 N. Sawyer Ave., Chicago.

MAKE money winter evenings. Turn your time into cash. Small capital. Particulars free. P. Benson, Stewartville, Minnesota.

MAIL Order Business. I start you free. P. Newnham, Waukegan, Ill.

SOUTH America's gigantic money making opportunities for large and small capitalists—and for colonists—send 10c for copy of consular report and booklet on Peru. Stevo. Sellan, Official Immigration agent for government of Peru, 1441 A. Old Colony Bldg., Chicago, Illinois, U. S. A.

SPECIAL Offer—Your name in our directory. Big mail for you. If interested in the mail order business; agents opportunities; plans, formulas, etc. Subscribe to our magazine three months, 10c. The "Lever" Mail Trader, 44 Elizabeth, New Jersey.

BE Your Own Boss. Start mail order business. We teach you. 20 years established. Everything furnished. "Starter" free. Krueger Co., Dept. 2B, 167 W. Washington, Chicago.

WIDE-Awake inventors, men with ideas and small manufacturing concerns may obtain financial assistance from the Kenton, Ohio, Commercial Club. Visit Kenton immediately if you mean business. Harry Hopwood, Sec'y.

1,000 MANUFACTURING mail order secrets. 25c. Stevens & Co., Buffalo.

SEND for my booklet "How you can become your own master," without capital in a business in which there is no competition. E. Daugherty, 1236 W. Madison St., Chicago, Ill.

ADVERTISERS, Mail Order Men, Circular Mailers. Join the Mail Order Business Club, particulars free. Circulars mailed, 15c 100. John Griesmaier, 5952 Lowe Ave., Chicago, Ill.

BIG Money in the Mail Order Business. Experience unnecessary. Small capital. Instructions free. Keith, 719 Central Bldg., Rochester, N. Y.

DISTRICT managers (men or women) wanted to handle our line of quick selling specialties through sub-agents. Small capital required. Big profits assured. Get busy now for territory. Sanito Co., Rochester, N. Y.

ESTABLISHED business in Grand Rapids, Mich. $2,500 cash or time. Would take automobile or diamonds as part pay. F. J. Lamb, 162 Baldwin Ave., Detroit, Michigan.

WANTED—Good automobile mechanic, with little capital to invest in growing business. Address Expert, 6th floor, 318 W. Washington St., Chicago.

MAKE your advertising pay better by placing it through a reliable, legitimate agency, at no extra cost to you. Get our advice about your proposition. Pevear & Co., Rochester, N. Y.

SEND for my circulars of new money making ideas. Postal will do. Chas. Metz, P. O. Box 87, Times Sq. Station, New York.

QUIT Wage Slavery. Own a Business. We start you. No capital required. Free particulars. Home Supply Co., Springfield, Missouri.

BE a chewing gum manufacturer at home, no machinery necessary, complete formula $1. Particulars for stamp. A. J St. Germain, 72 Canal St., Lewiston, Maine.

START a Money-Making Mail Order Business on $5 to $10 capital. Particulars free. National Sales Co., Peoria, Ill.

PATENTABLE Ideas Wanted—Send for 3 free books. R. B. Owen, 30 Owen Bldg., Wash. D. C.

MAKE money. Sharpen safety razor blades. This device sharpens any style blade. 50 cents prepaid. Free circular. Jens Mfg. Co., 1164-39th St., Brooklyn, New York.

INDEPENDENCE and fortune quickly attained in the Manufacturing Mail Order business. I furnish Formulas, Manufacturing Processes and Trade Secrets in all lines. Sold under positive guarantee; 18 years' practical experience. Revision and improvement of Formulas and Processes—reduction of manufacturing cost—utilization of waste materials, etc., a specialty. Booklet, Formula List, and Valuable Information Free. W. L. Cummings, Ph. D., 127 Standard St., Syracuse, N. Y.

BIG Profits for You! Manufacture Barley Crisp. New confection. 5c package costs you 1c. Machine, instructions complete $7.50 prepaid. Send 10c for samples. Barley Crisp Co., 1605 Hyde St., San Francisco.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

BE a Mirror Expert. $3-$10 day; spare time home at first; no capital; we train, start you making and silvering mirrors; French method. Free prospectus. W. P. Derr, Pres., 57 Saratoga Ave., Brooklyn, New York.

I WILL start you earning $4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operations. G. F. Redmond, Dept. 306, Boston, Mass.

MANUFACTURE Gold Letters for signs—$100 per month easy. I start you. Experience unnecessary. Take like wildfire. Prospectus free. J. F. McPherson, 673 Brown Avenue, Butler, Pa.

PATENTS Secured—C. L. Parker, 910 G St., Washington, D. C.

OPERATE Hahn's Premium Machines. Let them gather pennies for you. The best seller for cigars and candies. J. L. Hahn, 1016 Germantown Ave., Philadelphia, Pa.

FORM a corporation—Congress Law for D. C. and all States; cheap. Raise money easily. U. S. Legal Corporation, Washington, D. C. Representing $1,225,000,000.

COLLECT money by a sure, simple, system. Income $1,000 to $5,000 a year. Quick results. No capital required. Instructive book. "Skillful Collecting," free. National Collectors Ass'n., Long Street Newark, Ohio.

FORMULAS furnished by expert chemists, for manufacturing Toilet, Household, and Technical products. Government serial numbers obtained. Catalogue for stamp. B. Mystic Company, Washington, D. C.

WE Help Raise Capital at once to start you in retail—manufacturing—patent—real estate—mail order or any legitimate business by means of "Our Practical Method." Particulars free. The Business Aid Co., K504, Detroit, Mich.

AN intelligent person may earn $100 monthly corresponding for newspapers. No canvassing. Send for particulars. Press Syndicate, 700, Lockport, N. Y.

I Made $50,000 in five years with a small mail order business; began with $5. Send for free booklet. Tells how. Heacock, 5074, Lockport, N. Y.

FOR ADVERTISERS

YOUR 30 word ad in our 20 Page Postcard Magazine, 15c. Display, 50c inch. Elite Exchange, 3827 No. 44th Ct., Chicago.

PLACE your advertising through a reliable, legitimate, recognized agency, at no extra cost to you. Our expert knowledge of advertising and selling is at your service. What is your problem? Pevear & Co., Rochester, N. Y.

YOUR ad placed in nearly fifty magazines, 3 months, 5 cts. per word. Give us a trial ad. A. S. Mankin & Co., Alexandria, Va.

"THE Ad Writers' Assistant"—Book containing 350 phrases, headlines, suggestions, interesting opening chapters, each illustrated with appropriate cut, mailed, 25c. Cuts supplied. F. S. Ailes, Drexel Building, Philadelphia.

BARGAIN Advertising Rate—Just to get acquainted—15 words, one insertion, guaranteed 10,000 copies printed, and one year's subscription 25c. Digest, Grand Rapids, Mich.

STRONG, Persistent and Convincing copy for Form Letters, Followups, etc. Marshall Hathaway, Rolling Prairie, Ind.

500 GREAT advertising secrets, postpaid 25c. Morris, 617 Passyunk Ave., Philadelphia, Pa.

MECHANICAL ENGINEERS

ELECTRIC Light and Power draughting solicited. Robert Mather, Windsor Locks, Conn.

MACHINE designing and building our specialty. Consulting Mechanical and Electrical Engineers. Pullman-Field Machine Co., Sodus, N. Y.

MACHINE designing, working drawings, experimental machinery. Cary L. Abbott, Mechanical Engineer, 1241 Unity Bldg., Chicago.

IDEAS developed. Patent and working drawings. Blue printing. Julian Forrest Company, Desk H, Box 362, Providence, Rhode Island.

CEMENT

CONCRETE Building Block Machines and moulds. Free catalogue. 5 Market St., St. Louis, Mo.

CEMENT Finishing Tools. Eighteen $3; worth $14. Catalogue. Ernest Benninghofen, Hamilton, Ohio.

IF you want the best information on cement and concrete construction, subscribe for Concrete-Cement Age, leading cement and concrete monthly. Sample copy, 10 cents. Yearly subscription, $1.50. Concrete-Cement Age, 135 Newberry Bldg., Detroit, Mich.

ADJUSTABLE Burial Vault Moulds, new and simple. Make the best vault known and offers big profits for right man. Write for booklet. A. S. V. Co., Peru, Ind.

MACHINE making Building Stones, fifty cents. William Barten, Gordon, Nebraska.

COLLECTIONS

CLAIMS: all kinds, collected anywhere. Fidelity Credit Co., Richmond, Va.

AGENTS WANTED

AGENTS Wanted—Here's big money for you—and a stylish nobby suit absolutely free. $40 a week easy. Many are making more. Nothing to learn. Nothing to buy. Nothing to invest. No capital required. We furnish everything free—even the suit of stylish clothes you wear. Our men are the swell dressers and it don't cost them a cent, and they make big money every week. Get in now. Now is the time for the big money. Your name on a postal brings everything free. The handsomest lot of samples of the latest suitings you ever looked at to choose your suit from. And a book of fashion plates showing the very latest, nifty, nobby styles; also measuring blanks and everything needed—all free. We pay expressage on everything. Send that postal now—don't wait. This is your chance—grasp it. American Woolen Mills Co., Dept. 214, Chicago.

AGENTS—To sell the newest electric appliance on the market; sold everywhere there is electricity, in the home and office; liberal profits; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for $3.50 and saves the purchaser an investment of $25. Write for particulars. The Handy Light Co., 13 Handy Light Block, Cincinnati, Ohio.

BE Independent. Make $50 weekly with a New Invention, just patented. 8c profit on every dime. Small investment. Experience unnecessary. Circulars mailed free. International Metal & Ferrotype Company, Dept. B13, Chicago, Ill.

"AGENTS Wanted" advertisers are most successful and enthusiastic users of advertising space in Boyce's Weeklies. The 1,000,000 circulation pays big. Write for free Result Checking Book. Use letterhead. 500 Dearborn Ave., Chicago, Ill.

HAVE you a few hours to spare? We want man or woman in each town. No capital needed. An hour's work shows dollars earned in spare time. Pocket sample. 400% profit. B. C. Mfg. Co., (Dept. 104), 20 Warren St., N. Y.

AGENTS—Sell our high-grade line of perfumes, toilet articles, soaps and combination boxes. 150% profit. We are manufacturers. Hopfinger & Roth, 218 N. 2nd. St., St. Louis, Mo.

SIGN letters. Every firm wants them. Something entirely new. Nice, pleasant business. Paul Jacob, 25 Third Ave., New York.

KEY Checks—$1.45 per 100. Dies for stamping names on checks, fobs, umbrella plates. Wholesale prices—Collar clips, sewing awls, etc. We show you how to make $5 per day. Pease Die Works, Dept. M., Winchester, N. H.

AGENTS—Fine opportunity to make good money; brand-new, clean-cut proposition; want hustlers. Send for particulars today. Stewart Specialty Co., Chittenden Ave., Columbus, Ohio.

AGENTS Wanted for new rapid selling household specialties; particulars, catalogue and samples free. Fairchild Specialty Co., 3910 Bell St., Kansas City, Mo.

$21 PROFIT six hours; made by agents demonstrating most perfect hand power vacuum cleaner made (carpet sweeper type). Liberal commission and cooperation. Exclusive territory. Yaxley Mfg. Co., 1035 Wash. Blvd., Chicago.

INVISIBLE Pen-Pencil Holder. Holds several. Unique. Agents over hundred per cent. Sample 10 cents. Nouveau Sales Co., Raleigh, N. C.

AGENTS—Manufacture Excelsior polishing cloth. Formula, 25 cts. postpaid. Leroy Gipson, Rockland, Me.

GUILFORD Kerosene Mantle Lamps—America's largest variety. Burners fit ordinary lamps. The agents' sure money makers. Guilford Co., Seville, Ohio.

ORGANIZER'S Bonanza. Everybody wants land on the Co-operative Homestead Plan. A. Hawk, Crystal Springs, Fla.

AGENTS—New patent, just out, has unlimited field. Over 80% profit. Good side line. F. Huxley, 6032 St. Lawrence Ave., Chicago.

F. E. FUCHS, 38 Park Row, New York, wants agents who can sell a staple article. Both sexes.

$4 DAILY. Indestructible pens, outwear all others. Pkg. 10c. P. M. Miles Co., Lynn, Mass.

MAKE $21 next Saturday. Sell startling new invention—just out. Combination Burner and Filler for all Coal Oil Lamps. Unbreakable steel mantle. Big white powerful light. No smoke or smell. Fills Lamps quick. No dirty hands—no slopping oil. Low in price—selling like wildfire. Agents coining money. Johnson, Fla., cleared $40 first week. Hess, Iowa, made $7 one day. Exclusive territory and protection free. Not sold in stores. Send no money but write quick for details. Fairchild Co., 512 Nasby Bldg., Toledo, Ohio.

AGENTS with executive ability wanted to sell a mechanical device that positively removes shine from clothing. Case is highly-polished aluminum, and contains abrasive rollers. Same size as a cake of soap. A high-grade article, and owing to its usefulness and appearance it is selling rapidly. Send 50 cents for sample machine. Money back if not satisfied. Exclusive territory. Our proposition is liberal. Write now. L. D. Berger, 59 North 2nd Street, Philadelphia, Pa.

YOUNG Man, would you accept and wear a fine tailormade suit just for showing it to your friends? Or a Slip-on Raincoat Free? Could you use $5 a day for a little spare time? Perhaps we can offer you a steady job. If you live in a town smaller than 10,000 write at once and get beautiful samples, styles and this wonderful offer. Banner Tailoring Company, Dept. 27, Chicago.

SALESMEN, get our dazzling "Book of Gold" Men's Free Tailoring Outfit. Classiest ever attempted—the absolute limit of sartorial supremacy. Success sure. Our men coining money daily—hourly: "Book of Gold"—your gorgeous free suit—$5,000 cash satisfaction bond—smash competition. Get our wonderful Big Free Offer Quick! Postal brings everything for comparison; then see how measly otherwise are. Great Central Tailoring Co., Dept. 320 Jackson Blvd., Chicago.

WANT three swell made-to-measure shirts? Show our samples to friends, take a few orders easy and make enough profit to get yours free. New fancy patterns, made just as you want them. One good agent wanted in each town, spare time or all time. Write for beautiful samples, wholesale and retail prices and our liberal offer. Peerless Shirt Makers, Dept. 3, Chicago.

AGENTS—Be quick—get the agency—never such a seller—make $100 a week—Model Vacuum Cleaner—carpet sweeper type—wonderful suction—Sells for $8.50—your profit over 100 per cent—no competition—patented—we start you—the Cleaner sells itself—free samples to workers. Model Vacuum Co., D50, Cincinnati, O.

OUR wonderful stove lid saves one-half of coal; hundreds in use; requires only ordinary mechanical ability to install; demand tremendous; the biggest seller of the year; 150 per cent profit for agents; write quick for full particulars, testimonials, etc. Pre-Heated Air Co., Room 627, 1011 Chestnut St., Philadelphia.

AGENTS—Would You Take a Steady Job where you can make $30 weekly and chance to work up to district manager with yearly profit of $3,000 or more? No experience required. My goods are snappy self-sellers that make and hold customers. Need fifty more agents now. If you want to make big money quick, write today. E. M. Davis, 1038 Davis Block, Chicago.

$50 A WEEK upwards; agents wanted for the sale of electric light intensifiers; a new invention which doubles the light without extra current; interesting to every user of electric light; limited territory reserved for agents; apply at once. Intensifier Light Co., New Britain, Conn.

YOUR Boy's Spending Money—Boys, also men, wanted in every city, village and rural district to put up the Never Slip Clothes Line Holder. Big profits. Send 15c for complete working outfit. Address C. N. Allerding, Mansfield, Ohio.

THOUSAND Agents immediately. New device. Repairs puncture in one minute. Automobile owners delighted. Agents make day's wages every sale. L. M. Zinser, Monte Vista, Colorado.

$1,000 EARNED by three people within thirty days selling our Fire Extinguishers. Buyers everywhere; protected territory; 500% profit. Local and State Agents wanted. United Manufacturing Company, 1242 Jefferson, Toledo, Ohio.

AGENTS Wanted—We want a live man in every town to act as a sales manager. We want you in your town. Devote your spare time to our business and you will make bigger money than you ever made before. Give us all your time and we will make you rich. These are facts, not promises. $50 a week at the start. Besides, a nobby free suit—and all the clothes you want at less than wholesale price. Wear one of our free suits as an advertisement and people will flock to you to buy a suit like it and you will coin money. Get our money making proposition and beautiful book of samples. Just send a postal card. We pay express charges on everything. Join the live wires—send us a postal today. Paragon Tailoring Co., Dept. 214, Chicago.

AGENTS own your own business; no capital needed; steady income selling our new changeable signs, gold and silver letters; in demand everywhere. Write for catalogue. Climax Novelty Co., 703 Gay Bldg., St. Louis.

AGENTS—We have a proposition that appeals to every live agent. Write immediately for full particulars. Cowal Specialty Company, Department AC, Box 847, Richmond, Virginia.

SELLING Agents Wanted for "Fire Out." Best selling small fire extinguisher. A real money maker for you. Our proposition won't disappoint you. The Inst. Lighter Co. Dept. M., Columbus, Ohio.

AGENTS—Guaranteed Shoes, "must give satisfaction" or new pair free. All styles. Fit guaranteed. 98c profit on every sale. Quick seller. Write today for complete outfit. Guaranteed Shoe Co., 2262 Third St., Dayton, O.

AGENTS Wanted—Send 35 cts. for 1 tube of water proof shoe polish in aluminum case with dauber and polisher complete, and one of each of our catalogues, of rubber stamp, novelties, etc., with agent's terms. A. S. Mankin & Co., Alexandria, Virginia.

AGENTS—Get particulars of one of the best paying propositions ever put on the market. Something no one else sells. Can make $4,000 yearly. E. M. Feltman, Sales Manager, 6124 Sycamore St., Cincinnati, O.

AGENTS on salary or commission. The greatest agents' seller ever produced; every user of pen and ink buys it on sight; 200 to 500 per cent profit; one agent's sales amounted to $620 in six days; another $32 in two hours. Monroe Mfg. Co. X. 6, La Crosse, Wis.

$10 TO $15 per day easily made, 15% profit, exclusive territory; our new cleaning, polishing, and dustless mop is the big money getter and record breaker. Duncan Bros., 2910 N. Troy St., Chicago.

AGENTS — Something live — something fresh—something new. Something that's a seller, and bringing our boys $35 a week and up. National Manufacturing Co., Lemont, Ill.

AGENTS—Get busy; latest invention. Fix It. Millions being sold; orders coming fast; act quick; big profit. Sample 10 cents. Eastern Specialty Co., Hoboken, New Jersey.

AGENTS—$50 to $75 weekly guaranteed—General Agents to handle our Special Accident Policies, issued at $1 to $5 per year. Address Wm. Okey Weaver, Mgr., Schultz Building, Columbus, Ohio.

SALESMEN wanted to handle our specialty; sells at sight; earn big money easily; write for free instructions. American Specialty Co., 5 Mechanic St., Bradford, Pa.

AGENTS wanted for best automobile accessory proposition ever offered. Power Tire Pump to sell for ten dollars. F. E. Lortz Co., 2503 E. 55th St., Cleveland, Ohio.

AGENTS—Every home wants our specialty. Quick sales; $4 to $7 daily made. Fall leader sample free. W. E. Yates & Co., 1818 Clawson St., Upper Alton, Ill.

BURGLARS Beware! Best alarm invented, lever action, no wires, fires blank cartridge; sleep peacefully, intruders fly. Secure agency, make money, sells itself. Send 35c for nickeled sample. MacCarthy Co., 361 7th St., Brooklyn.

AGENTS—Stop canvassing. Our district managers are making big money employing sub-agents. You can also. We show you how. Write for particulars stating territory preferred. Sanito Co., Rochester, New York.

MEN, Women, one-half is yours. Something old. Good seller. Good repeater. Not sold in stores. It's Forkla. Bacorn Co., Elmira, N. Y.

WASHING Done By Vacuum, no rubbing, sells on sight, $2.25. Sample to agents, $1.25. Woman's Labor Saving Device Co., Box 541, Minneapolis, Minn.

SILPLATE plates brass, copper, etc., with one rub. Guaranteed. Send for 50c bottle and agents' proposition. Wirthman Laboratories, Sixteenth and Grand, Kansas City, Mo.

AGENTS send for catalogue of household novelties, quick and easy sellers. Martin L. Zerega, Dorchester, Mass.

AGENTS—My Twelve "Moneymakers" bring repeat orders. Easy selling plans. Big profits. A. Rolfe, 923 N. Alder, Philadelphia, Pa.

SMALLEST alarm clock, Bible and telescope, 10c each prepaid. W. H. Gardner, A 1408 W. 22nd St., Los Angeles, Cal.

AGENTS—Advertising Pencils. Sample stamped with your name, etc., 10c. Randall Novelty Co., Nashua, N. H.

LADY Agents Wanted. Englewood Distributing Co., 5952 Lowe Ave., Chicago, Ill.

BIG money makers, particulars for red stamp. Detroit Filter Co., Detroit, Mich.

WHERE did your money go? Find out. Begin any time with our Daily Expense Record. It will keep you posted and reduce expenses. A very interesting and complete book—50c. Agents wanted. Auburn Supply Co., Dept. HH, 7746 Peoria St., Chicago.

HUSTLERS to sell splendid article, needed in every home and office, sure repeater, great money saver, salesmen coining money, 100% profit; Leroy Specialty Company, Desk 1, Huntington, Ind.

AGENTS! 1000% profit selling our beautiful religious Masterpiece "Christ at Golgotha." Size 14x28 inches, beautiful colors. Sells like wildfire for 25c. Your cost $2.50 per hundred. Sample 10c. Merchants Specialty House, 521 Dearborn St., Chicago.

CHANDELIER Clothes Dryer—Pulls up to ceiling on porch or in house. Clothes out of way. Holds good size washing or ironing; weighs three pounds; sent prepaid. $1.50. Every home will buy one. Agents wanted—Auburn Supply Co., Dept. DD, 7746, Peoria St., Chicago.

SELL dealers, make 50 per cent on sales; good article, attractively displayed. Retails 10c; send 5c for sample. Rawlings, Box 1053, Central Station, St. Louis, Mo.

AGENTS—New Invention—Electric Cigar Lighter—Used on cigar cases. Sell to stores—best seller—big profits. Write for special starting offer. Drake Mfg. Co. 142 Reed St. Milwaukee, Wis.

AGENTS Wanted: sell our mission furniture. Big commission; exclusive territory. Dept. F. Lewis, Grove & Co. P. O. Box 183. Bluffton, Ind.

AGENTS—Big profits selling California Honey. Permanent business; steady repeat orders. Leaflet free. Spencer Apiaries Co., Box 199. Nordhoff, Calif.

CASH for names, addresses, information, etc. Steady income at home. Instructive booklet for stamp. Information System, 287 Marietta, Ohio.

AGENTS—Start now, just in season, big profits, easy sales. H. Vale cleared $2,100 last year, McFadden $1,800 selling Photo handle knives and razors. Write United Cutlery Co., E. Fourth, Canton, Ohio.

SIDE line—office specialty. Sells from pocket. 150 to 200% profit. Bayless Sons Company, Muncie, Indiana.

AGENTS and canvassers for books write for particulars. Kirk A. Box 3002, Philadelphia, Pa.

READ the Agents Magazine. Make more money. 2 months 10c. Agents Magazine, Chicago.

SIGN Agents—Painters—Something new and better. Attracto ready-made Gold and Silver letters. 21 kinds, easily applied. Make big money lettering store windows, making signs, and selling our line of flashing, sparkling chipped glass name-plates. No experience needed. Write for sample letter and catalogue and start at once. Address Atracto Sign Co., 2655 North Clark Street, Chicago, or 519 Pacific Bldg., San Francisco.

LEARN Telegraphy at home—get salary $100 month. Write now—Telegraphy—Box 481—Minneapolis, Minn.

$50 A MONTH earned at your own home! No canvassing or collecting required. All our work may be done in any room of the house in spare time without interfering with your regular duties and without your nearest neighbor knowing you work for us. New system of business and the greatest offer ever made. Write now before it is too late! Blye & Co., Dept. 31, Terre Haute, Indiana.

MAN wanted as exclusive agent. We manufacture six styles Self-wringing Mops, for all purposes, including an absolutely new combination Scrubbing, Brushmop that is Self-Wringing. Every women wants this proven success. New inexperienced men make $9 per day. One man made $120 the second week. No investment. Send for catalogue and exclusive territory proposition that will make you independent. Hilker Mop Co., 1200 Grand Ave., Chicago, Ill.

YOU can make big money handling our proposition—something unique—an article that can be sold in every house. The business can be worked by you either along Mail Order or Agency lines with unusual profit. Send ten cents for sample and wholesale prices or write for our literature; it's free. Northern Supply Co., 3453 N. Hamilton, Chicago.

MAKE $5 to $25 weekly in spare time as my representative. I manufacture three household articles every woman needs and buys. My prices are the lowest and Agents make over 100 per cent profit. Write today for particulars. J. C. Hoag, 553 Carpenter St., Mt. Airy, Pa.

BEST Yet. $6 Profit on Each Sale. One lady agent took 5 orders first morning without experience. Rev. Waterman of Iowa sold 39 in 5 days. Any one can do it. Best and easiest operated Double-suction cleaner made, guaranteed 5 years. Warner Vacuum Cleaner Co., Box "Z," Muncie, Indiana.

NEW Invention—Flat Collar Button; lies flat; takes pressure from back of neck; constant pressure injurious; coat collar sets better; ties slip easier; agents coin money; new self selling plan; no canvassing; samples 10c. Carl Brown, Dept. P1, Columbus, Ohio.

AGENTS. More than double the sales in 1912 over 1911. If your locality is not now covered we can give you an agency which will net you $15 to $35 per week. Only people with good references need apply. Condicply Co., Box 1166, Boston, Massachusetts.

AGENTS—$20 to $40 weekly selling Hosiery, Underwear, Sweaters. Samples free to hustlers. Large line. Liberal commission. Sales Manager, Room 62, 54-60 Worth St., New York.

DID you ever hear of anyone selling Popular 25c Sheet Music at 5c? You can do it, and make 300 per cent. Four sample copies and proposition, 10c. Chicago Book & Music Co., 535 S. Wabash Ave., Chicago.

70c COMMISSION on $1 pictures; new, beautiful; sell quickly into Catholic homes; profitable employment for reliable men and women everywhere. William F. Butler, Dept. J, Milwaukee, Wis.

WE furnish you capital to run a profitable business of your own. Become our local representative and sell guaranteed sweaters, shirts, neckties, underwear and Hosiery direct from our factories to the homes. Write, Steadfast Mills, Dept. 10, Cohoes, N. Y.

AGENTS sell rich looking imported 36 x68 rug $1. Carter, Tenn., sold 115 in 4 days. Profit $57. You can do as well. Write for selling plan. Sample offer. Exclusive territory. Sample rug sent by prepaid parcel post $.98. Condon, Importer, Stonington, Me.

$2.50 PER day paid one man or woman in each town to distribute free circulars and take orders for concentrated flavoring in tubes. Permanent position. J. S. Ziegler Co., 443-D, Dearborn St., Chicago.

AGENTS. If you don't make $4 profit the first day selling Tate's Guaranteed Dust Absorbing cloths, brushes, mops, etc., return sample outfit. Many agents make $25. Write quick for particulars. Dept. A-4. Consumers Direct Supply Co., Boston, Mass.

SELLING our exclusive linen heel and toe guaranteed hosiery direct from mill to wearer. Pays big profits. Customers waiting. Re-orders insure permanent, increasing income. Exclusive territory. Credit. N. Parker Mills, 720 Chestnut St., Phila., Pa.

SALESPEOPLE everywhere will wish to find out why agents of the "Ever Ready" Specialties are doing better than others. A postal will bring all particulars. A. Lowell Mfg. Co., 108 Fulton St., New York City.

EARN $7 to $12 daily, restoring faded colors in rugs and carpets. Whole or spare time. Original American Process. Great demand. No capital. Full particulars free. Eldred, Dept. 75, Detroit, Mich.

MAKE $10 daily restoring colors to faded rugs and carpets. Spare time. Tremendous opportunity everywhere. Simple, easy. Mirror Silvering course free. Free particulars. Coxe, Dept. MD., Omaha, Neb.

400% PROFIT. Quick Sales! Sell our Beautiful Air Brush Design Show Cards. 350 subjects, all businesses. Merchants buy on sight. Three big premiums free, just to get acquainted. Write today for catalog and premium offer. Merchants Specialty House, 523 Dearborn, Chicago.

AGENTS male and female wanted, for established proposition (Medical), stand strictest investigation, legitimate, good seller, splendid profits, write for samples, Edward Mulligan, Congers, N. Y.

AGENTS and Representatives Wanted. Non-Tarnishable Gold and Silver Window Letters, 70c per 100. H. Alexander, Manufacturer, 328 E. 59th St., New York. Established 1905.

AGENTS—100% profit—sell to saloons—machine a whirlwind seller. Free sample and salesmanship course. Two sales a day $15 profit. Write. Simplex Mfg. Co., Dept. 7, Kewanee, Ill.

AGENTS make 500% profit selling our gold window letters, novelty signs and changeable signs. 800 varieties in enormous demand. Catalogue free. Sullivan Co., 1238 Van Buren St., Chicago, Ill.

AGENTS—We have ready winter sellers. Agents make big money. Write for our large new catalogue. Edward J. Perrin, 2106 Bank Street, Louisville, Ky.

GUARANTEED Boy's Watch or Girl's Gold Plated Bracelet, given for introducing our seed in your neighborhood. Outfit free. P. Peoples Co., B-89, York Haven, Pennsylvania.

QUICK selling Vacuum Cleaner, powerful sweeper type. Free sample to hustlers. Make big money employing sub-agents. Experience unnecessary. Vacm Co., 1488 Security Bldg., Chicago.

BIG money in Essex Fan Motors, run by gas or gasoline. Winfield H. Smith, 10 Lock Street, Buffalo, N. Y.

SALESMEN wanted to sell advertising novelties, nail File and Tooth Picks in leather cases. 25% commission, 2 samples 16c. Joel Kenyon, Owego, N. Y.

AGENTS—Either sex. Handle three articles housewives use weekly. Unique selling plan. Constant repeaters. Permanent income. Attractive proposition. Leibman Mfg. Co., Richmond Hill, New York City.

AGENTS—Send today for my new proposition. Appeals to everyone. 100% profit. Raymond Pfau, Wenatchee, Wash.

WE Pay $80 A Month Salary and furnish rig and all expenses to introduce our guaranteed poultry and stock powders. Address Bigler Company, X368, Springfield, Illinois.

AGENTS—men and women, newest invention. Wing Self Heating Gasoline Flat Iron; guaranteed, sells everywhere. Women delighted. Write for particulars. Wing Mfg. Co., 1608 Fulton St., Chicago.

ONE Million Agents Wanted. Fast sellers costing 2c, selling 25c, in quantities to $50. Every firm needs. Postal brings samples. Embossed Co., 240 West Illinois St., Chicago.

AGENTS—Make $2 each selling our wonderful luminous crucifixes; nothing to sell six a day; absolutely new; shine all night in darkest room. Pioneer Portrait Co., 1259 W. 63rd St., Chicago.

SIGN Painting Agents. 1000% profit. Best and cheapest window letters made. Mounted sample free. Success positively guaranteed. Embossed Letter Co., 245 West Illinois St., Chicago.

YOU can make more money operating a Mail Order business, but before taking any chances invest 10c for two samples of "Booster"—the one bonafide Mail Order and Agents publication on earth—a magazine that has for years actually and accurately started others like you in business for themselves by publishing the best money making propositions on earth—ones that really get the money! Send 10c today—its worth dollars to you. Booster Magazine, Northwestern Building, Chicago.

$61.50 WEEKLY introducing and selling a new Gas Light Burner for Kerosene Lamps. Beautiful light. No chimney. No mantle. Perfectly safe. Simple in construction. Nothing to get broken or out of order. Will not burn out. Durable. Will last for years. Low price. Easy to sell. 200 per cent profit. Experience not necessary. Sample free. Why not try one on your lamp? Beware of imitations. No branch offices. Luther Manufacturing Co., Dept. 189, Cincinnati, Ohio.

AGENTS sell Pals Changeable Scarf Pin, make $30 weekly, send stamp for free sample. Pals Manufacturing Company, 25 East 14th Street, N. Y. City

"KNIFE and Fork Cleaner" made of cork, felt and steel. Great, new agents' article. Sample 10c. Bauer, 135 East 34th, New York.

SHOW Card Agents making barrels of cold cash. Great two color catalog free. Write today. Popular Show Card Co., Dept. FB, 1235 Michigan Ave., Chicago.

AGENTS—Big profits selling herb medicine. Repeat orders. Knox Mfg. Co., Peoria, Ill.

SALESMEN—Make big money selling our devices. Wasge Electric Co., 680 W. Madison, Chicago.

ANYONE can make big money easy selling the Aladdin Kerosene Mantle Lamp. No experience necessary. A demonstration sells a lamp in nine out of ten homes. One agent sold over 1,000 on money-back guarantee, not one returned. Another made over $300 in 15 days. Hundreds doing as well. Evenings may be made profitable. Special introductory offer to the first man in each neighborhood who writes for agency proposition. Mantle Lamp Co., 351 Aladdin Bldg., Chicago, Ill.

AGENTS—$50 weekly; we manufacture the best needle case made, a wonderful seller; 200 to 500 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" Envelopes do the work; general agents can make over $100 weekly; send 10c for a 25c sample containing 115 needles; particulars free; buy direct from the factory at wholesale. Paty Needle Co., 102 Union Sq., Somerville, Mass.

AGENTS—County and State; men and women everywhere to sell the Pinless Clothes Line; a practical labor saving invention. lasts life-time. sells on sight, gives perfect satisfaction. Agent Sutton of Georgia, sold over million feet; 100% profit; write quick for exclusive territory; information free; sample prepaid 25c stamps. Pinless Clothes Line Company, 520 Wilcox Bldg., Portland, Oregon.

BEAUTIFUL Embossed Gold Window Letters make 1000% profit without experience. New easy proposition. Signs always needed. Ours last for years. Rock bottom prices. Essentials to work with mailed free. Embossed Letter Co., 235 W. Illinois St., Chicago.

AGENTS. One cent invested in a postal card will bring you a $35.00 to $60.00 a week proposition. Sterling Aluminum Co., Canal Station, Chicago, Ill.

AGENTS. Cost 2c, sell 25c. Sign letters put on with roller. Samples free. Embossed Letter Co., 230 West Illinois St., Chicago.

SHAVEZY Guard makes Safety Razor of your own favorite blade. Excellent line for shopmen everywhere. Sample 25c. Particulars, red stamp. Keon Mfg. Co., Waltham, Mass.

BOKARA Diamonds—Agents, everyone, to wear and sell our famous Bokara Diamonds. Write for sample offer and catalogue Free. Northwestern Jewelry Co., 52 Northwestern Bldg., Chicago.

$10 A DAY for Agents. Selling the New 1912 Fall Style Silk Neckties and giving free with each purchase a beautiful Monogram Roman Gold Finish Cuff Link and Stick Pin Set. Samples free. Dayton Neckwear Co., Room 25, Dayton, Ohio.

BE Independent! Start a mail order business in your own home. We tell you how, and furnish everything needed wholesale. An honorable and profitable business for man or woman. Particulars free. Many make $3,000 a year. Murphy Mfg. Co., South Norwalk, Conn.

MEDALLIONS sell at sight, 300 per cent to 500 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Resag Co., 1205 W. Randolph St., Chicago.

AGENTS—700 Things a Boy Can Make—Can you beat it? Set of 4 books that sell for only $1. Everyone is interested. Enough to keep a boy busy until he grows up. Parents want them for their lads. Good liberal commission. Exclusive territory. Write to Popular Mechanics, Book Dept., 318 W. Washington St., Chicago.

AGENTS—Easily earn $25 to $40 per week selling Kno-Darn Guaranteed Hosiery; direct-from-the-mill proposition; 20% better, costs less; M. Garwood sold $400 worth in six weeks; send for free sample; no money required. Kno-Darn Hosiery Mills, Desk 15, Dayton, Ohio.

WE are the largest manufacturers of Twisted Wire Brushes in America. Highest grade goods, best service, highest profit. Write for our new catalog. You are sure to win. Fuller Brush Co., 33 Hoadley Place, Hartford, Conn. Western branch, Wichita, Kansas.

AGENTS make big money selling our new gold letters for office windows, store fronts and glass signs. Any one can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 406 N. Clark St., Chicago.

AGENTS—We manufacture glass paper. Plain glass windows made to look like real stain glass; something new; easily applied; big money maker; two sample sheets of paper, with catalogue in colors and discount sheet, for 10c. S. H. Parrish & Co., 202 S. Clark St., Chicago.

AGENTS Wanted—Mechanics and shopmen make over $100 a month in spare time selling transparent handled novelty knives and razors. Big profits. Sales easily made. Write for terms today. Novelty Cutlery Co., 67 Bar St., Canton, O.

YOU can make $$$$ as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pitkin, 113 Redd St., Newark, N. Y.

500% PROFIT selling our wonderful sign letters for office windows, store fronts and glass signs; resembles finest gold leaf; easily applied; samples free. Metallic Letter Co., 406 N. Clark St., Chicago.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

AGENTS—What size Silk Hose do you wear? Send no money. Write today. Offer expires 30 days. Agents wanted in every town. Large profits. Beautiful line. Triple-Wear Mills, Dept. D., 112 So. 13th St., Phila., Pa.

AGENTS—Handkerchiefs, dress goods. Carleton made $8 one afternoon; Mrs. Bosworth, $25 in two days. Free samples. Credit. Stamp brings particulars. Freeport Mfg. Company, 59 Main St., Brooklyn, N. Y.

AGENTS—Portraits 35c. Frames 15c. Sheet Pictures 1c. Stereoscopes 25c. Views 1c. 30 days' credit. Samples and catalog free. Consolidated Portrait Co., Dept. 1196, 1027 W. Adams St., Chicago.

PORTRAIT Agents—Send for free catalog Portraits, Frames, Medallions, Pillow Tops, Sheet Pictures, etc. Prices, quality considered, lowest of any. Pioneer Portrait Co., 1265 W. 63d St., Chicago.

AGENTS—Our Columbia Folding Hand Bag is the best proposition on the market. Not sold in stores. Big profit. Write for terms and other big sellers. S. V. Diamond, 35 West 21st St., N. Y. C.

I WILL start you earning $4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

AGENTS—250% profit. Wonderful little article. Sells like wildfire. Can be carried in pocket. Write at once for free sample. H. Mathews, 1902 Third St., Dayton, Ohio.

AGENTS—Ask us about our snappy household specialty line which will clear you $50 to $80 weekly. American Aluminum Co., Div. 7, Lemont, Ill.

I WANT salesmen to sell an advertising novelty of merit. Side line or exclusive. Sample free. Desk 1, Andrew Paysen, Clinton, Iowa.

AGENTS make $30 week by selling our 500 handy household articles; catalogue free. Scheff Co., Desplaines, Illinois.

AGENTS—Do you want to make big money? Then write today for our plan and be independent. Benjamin Ray & Co., Box 479, Lumpkin, Ga.

DON'T fail to read Independence and Fortune under Business Opportunities.

AGENTS—Ladies or gentlemen, to sell the highest grade toilet goods, flavoring, etc., direct to families. High class house; fair dealing; repeat orders sure; large cash commissions. Address Kingham Bros., Indianapolis, Ind.

HOT Seller. Over 100% profit. House door guard. Every housewife wants one or more on sight. $1 a dozen. $10 gross. Sample postpaid, 20c. Allen Door Guard, 215 Loomis Street, Chicago.

400% PROFIT selling Gordon Photo Pillow Top. High grade work. Samples and catalogue free. Luther Gordon Co., Northwestern Bldg., Chicago.

REPRESENTATIVE wanted in every city and town—whole or part time—to handle best paying business known. Legitimate—new—exclusive control—no canvassing. Address Drawer 165D, New Haven, Conn.

PERFECTION Pocket Adding Machine. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. B. Cincinnati, Ohio.

AGENTS—Mail Order Men. Your 25 word ad in 100 Magazines, $1. Box 22, Station B, Worcester, Mass. The Williams Specialty Co.

AGENTS in every town, best selling household articles. Start at once. Large demand for goods. $25.00 to $50.00 a week. Success assured. Investigate today. Main Specialty Co., Dept. H, Williamsport, Pa.

AGENTS wanted for Oriental novelties, never before seen in America. Quick sellers. Repeaters. Immense profits. Shaw Kanematz, Box 529, Portland, Oregon.

1500% PROFIT selling our Gold Sign Letters. We'll show you how. Sample free. Johnston Co., Quincy, Ill.

PHENOMENAL Success awaits salesmen with our sales-driving specialties. Emporium Co., Minneapolis, Minn.

HELP WANTED

WE train detectives. You can be one. Splendid opportunities. Travel. Earn $100 to $300 monthly. This fascinating profession taught practically and scientifically by mail at a nominal cost. American School of Criminology, Dept. F, Detroit, Mich.

GET Away from wage slavery—make more money! Operate a good substantial Mail Order business—our "Silent Salesman" system—can easily be done in spare time yet the possibilities are unlimited. For years "Booster" has actually and accurately led thousands like you over the Successful Road to Wealth. To succeed you've got to read The Booster Magazine for "Booster" is Opportunity and starts you in business for yourself—tells you how to get the dollars by putting you next to the best money making propositions on earth—ones that really get You the money! Send 10c for two months trial subscription. Booster Magazine, Northwestern Building, Chicago.

SALESMEN—You can do a wonderful business with the Jewel Vacuum Sweeper (3 sizes.) It is the perfect non-electric household cleaner. Sightly, attractive, light, strong and absolutely efficient. Our salesmen are "cashing in" on its merit. We give you merchants' standing—with credit to do big business and advertise the Jewel in your local newspapers over your own name. A big offer for able men or women. Exclusive territory. Address General Appliance Factory, 1372 Main Street, Marinette, Wis.

MEN and Women Wanted for Government Positions. $90 month. Thousands of Parcels Post Positions open. Annual vacations. No "layoffs." Common education sufficient. Influence unnecessary. Farmers eligible. Send postal immediately for free list of positions open. Franklin Institute, Dep't K21, Rochester, N. Y.

YOUNG Man, would you accept and wear a fine tailormade suit just for showing it to your friends? Or a Slip-on Raincoat Free? Could you use $5 a day for a little spare time? Perhaps we can offer you a steady job. If you live in a town smaller than 10,000 write at once and get beautiful samples, styles and this wonderful offer. Banner Tailoring Company, Dept. 28, Chicago.

GET Your Preparation for the United States Civil Service Examinations from former United States Civil Service Secretary Examiner. "One Who Knows." Free Booklet. Arthur R. Patterson, Rochester, New York.

500 MEN 20 to 40 years old wanted at once in every state for Electric Railway Motormen and Conductors; $60 to $100 a month; no experience necessary; fine opportunity; no strike; write immediately for application blank; address Manager, W 11, Dwight Bldg., Kansas City, Mo.

U. S. GOVERNMENT needs thousands Railway Mail Clerks—Carriers—to handle Parcels Post. $90 month. Vacations. Examinations everywhere soon. Common education sufficient. Write for list of positions open. Franklin Institute, Dep't K 21, Rochester, N. Y.

BIG Money Writing Songs—We pay hundreds of dollars a year to successful writers. Experience unnecessary. Song poems wanted with or without music—will pay one-half of profits if successful. Send us your work today. Acceptance Guaranteed if Available. Largest concern in the country. Free particulars. Dugdale Co., Dept. 265, Washington, D. C.

YOUNG men to learn shorthand. Big salaries. Assistance securing positions. Correspondence course by world's greatest court stenographer. Catalogue M free. Osgoodby School Stenography, Rochester, New York.

RAILWAY Mail Clerk examinations everywhere soon. Parcels Post requires thousands. Write for dates. Franklin Institute, Dept. K 21, Rochester, N. Y.

A MONEY Proposition—Represent me for half of the profits. Printing matter furnished free. Full particulars of my successful Mail Order Business on request. Hazen A. Horton, Desk 617, Tekonsha, Michigan.

GOVERNMENT Railway Mail Clerk examinations everywhere soon. Get prepared by former Government Examiner. "Real Courses." Write now for free booklet. C. Patterson Civil Service School, Rochester, New York.

PARCELS Post Jobs open. Write for list. Franklin Institute, Dep't K 21, Rochester, N. Y.

AGENTS make big money and become sales managers for our goods. Fast office sellers. Fine profits. Particulars and samples free. One Dip Pen Company, Dept. 2, Baltimore, Md.

BE a Detective: Big pay. Easy, pleasant work. Traveling everywhere. Write National Detective Agency, Department 2, Houseman Block, Grand Rapids, Mich.

GOVERNMENT Jobs Open to Men and Women. $90 month. Write for list of positions open. Franklin Institute, Dep't K 21, Rochester, N. Y.

BIG Profits. Open a dyeing and cleaning establishment, little capital needed. We teach by mail. Write for booklet. Ben-Vonde System, Dept. C, Charlotte, North Carolina.

EARN $10 to $15 a week, and hold your position besides. No canvassing. We, as manufacturers of patented just-in-season specialties, have new easy mail order plans to keep factories busy. We furnish everything. Large profits. Small capital. Experience unnecessary. If you are one of the want-to-go-ahead kind, write for our most modern (copyrighted) plans. Sworn Statement. J. M. Pease Mfg. Co., 540 Pease Bldg., Main St., Buffalo, N. Y.

LOCOMOTIVE Firemen and Brakemen for all railroads, $80 to $100 monthly. Age 18 to 35. Experience unnecessary; no strike. Promotion, Engineer, Conductor. Railroad Employing Headquarters—over 400 men sent to positions monthly. State age; send stamp. Railway Association, Dept. 89, 227 Monroe Street, Brooklyn, N. Y.

CANVASSERS, $30-$60 weekly selling distinctive, individually tailored raincoats. No capital required, pocket samples, prices low, whole or part time. Write Sanitary Coat Specialists, New York.

ENTER the Merchant Tailoring Business for yourself. Learn to cut men's clothes by our easy system. Big profits—no investment. Full particulars free. Write today. Success School of Cutting, Dept. 11, Jackson, Mich.

DRAFTSMEN—A few slightly soiled copies "Dimensions, Pipe Fittings and Valves" 30c. "Structural Drafting" 75c, both $1. National Book Co., Collinwood, Ohio.

DETECTIVES earn from $100 to $500 per month. How much are you earning? Write for particulars. Interstate Detective School, Peoria, Ill. Suite 25, McDougal Bldg.

$$$$$$ REPORT local information, name, etc., to us. Big pay. Confidential. Enclose stamp. National Information Sales Co., AFR, Cincinnati.

SECURE position you desire, get my book, explains how. Particulars free. Stafford Publishing Co., 44 Madison Ave., Bridgeport, Conn.

WANTED—Distributors of advertising matter everywhere. American Distributor, Blairsville, Pennsylvania.

IF you want help, tell your wants in 1,000,000 rural homes simultaneously. Use Boyce's Weeklies. Write for free result Checking Book. Use letterhead. Classified Dept., 500 Dearborn Ave., Chicago, Illinois.

BIG money collecting and selling names. Either sex, any locality. Send 25c (coin) for names of firms that buy names. W. R. Summerhayes, Tama, Iowa.

MEN and Women Wanted for Government Positions. $90 month. Parcels Post means thousands of appointments. Write for list of positions open. Franklin Institute, Dep't K 21, Rochester, N. Y.

SONG Poem Wanted. New Plan. Big money. Free book tells all. Hayworth Music Co., 660 G, Washington, D. C.

WANTED—Railway Mail Clerks. $75 month. Examinations everywhere. Coaching free. Franklin Institute, Dep't K 21, Rochester, N. Y.

WANTED—A high class reliable sales manager for a store fixture without competition. Commissions $300 to $500 per month. Address The Buckley Specialty Co., Lima, Ohio.

TRUSTWORTHY agent for ideal Raincoat proposition of highest order. Large commission basis; pays big. No cash with order. English Raincoat Tailors Co., Ltd., New York.

BE your own Master! Stop Wage Slavery! Formulas and instructions for manufacturing Six Big Sellers and 100 Business Opportunities sent for 10c. Particulars free. M. Iverson, 819 N. St. Vrain St., El Paso, Texas.

CASH for information, names, formulas, and ideas. Steady, profitable home business. Instructive booklet for stamp. Information System, 288, Marietta, Ohio.

START "New Specialty" mail order business at home evenings and spare time. Very profitable. Everything furnished Particulars free. Box 134A, Newport, Ky.

SALESMEN to sell guaranteed brooms. Stores or private. Good commission. Excellent opportunity. Palma Atlas Broom Works, Palm, Penna.

WANTED—Distributors, men or women to give away free packages our famous Perfumed Borax Soap Powder; no money or experience needed; good pay. Ward & Co., 1775 Berteau Ave., Chicago.

ANY intelligent person many earn good income corresponding for newspapers. Experience unnecessary. Address Press Correspondence Bureau, Washington, D. C.

EARN $7 to $12 daily, restoring faded colors in rugs and carpets. Whole or spare time. Original American Process. Great demand. No capital. Full particulars free. Eldred, Dept. 75, Detroit, Mich.

MAKE $30 to $60 weekly—Representing us. Permanent business with dignity and prestige. Standard Safety Lamp Co., 157 W. Randolph Ave., Chicago, Ill.

MAKE $10 daily restoring colors to faded rugs and carpets. Spare time. Tremendous opportunity everywhere. Simple, easy. Mirror Silvering course free. Free particulars. Coxe, Dept. MD., Omaha, Neb.

WANTED—Hustling man, every town, and country community. Who wants to get ahead, learn, and earn more. Fine chance. Write quick for full particulars. Box A2-293, Covington, Ky.

LADIES—Earn money coloring pictures and postcards; samples and instructions, 20c. Dept. 61, Roxbury Card Co., Roxbury, Mass.

HERE'S Your Chance—Full course of instruction in Silvering Mirrors, for 50 cents. Max Swift, 158 Suffolk St., New York City.

SALESMEN—Several good men; oils, paints; no experience. Signet Oil Co., Cleveland, Ohio.

GOVERNMENT Examinations. Most thorough preparation; $5; returned if not appointed; particulars free. American Civil Service School, Washington, D. C.

WANTED one thousand chauffeurs and repair men. Our demand for automobile engineers exceeds the supply. Calls for men of intelligence and mechanical bent capable of commanding $100 to $150 per month upon graduation. Resident course $20 to $60. Home Correspondence course completed by practical road and shop work at this school, highly successful. Look this up. Auto Schools of America, Dept. T, 1600 Michigan Ave., Chicago.

WANTED—Agents, Machinists, Attention! Increase salary, new revised Saunders' Hand-Book of Practical Mechanics. Best ever ready reference. Thousands in use. Postpaid $1 cloth; $1.25, $1.50 leather flap. Big profits. E. H. Saunders, 216 Purchase St., Boston, Mass.

WANTED—A man or woman, all or spare time, to secure information for us. Work at home or travel. Experience not necessary. Nothing to sell. Good pay. Send stamp for particulars. Address M. S. I. A., 522 L Building, Indianapolis, Indiana.

THE demand for cartoonists is increasing. Many young men have talent, but not the opportunity of developing it. We can suggest an inexpensive method that will aid anyone anxious to take up the study of drawing. Send your name and address to Box 223, Glencoe, Ill.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

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Continued from Page 34

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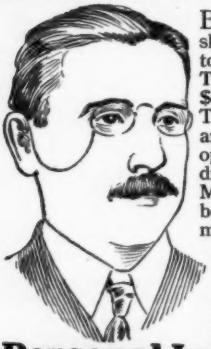

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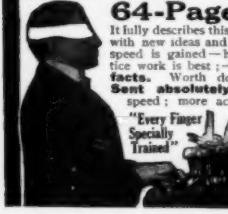

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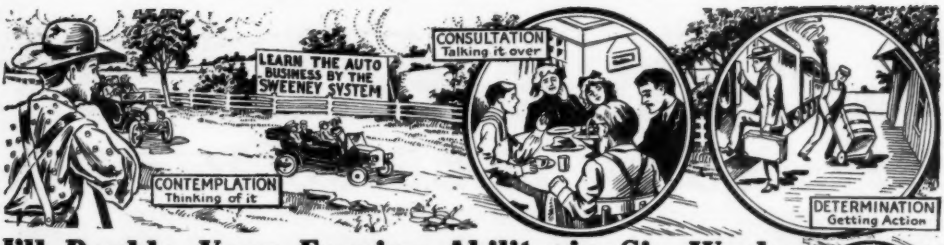

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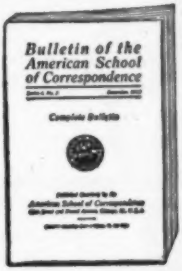

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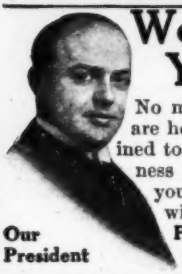

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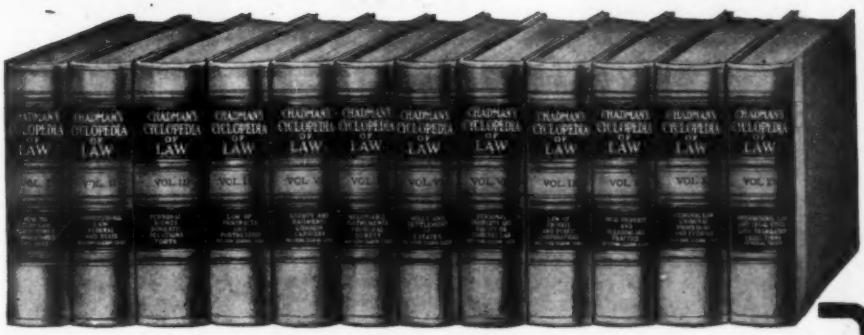

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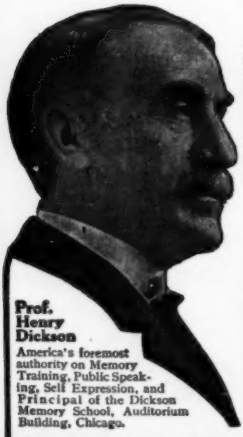

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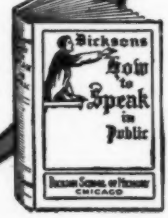

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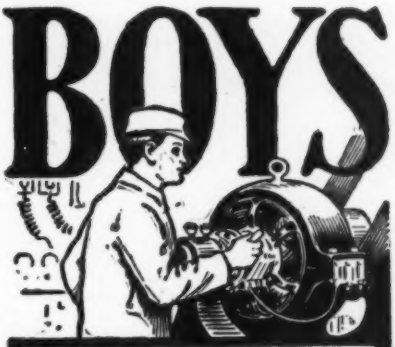

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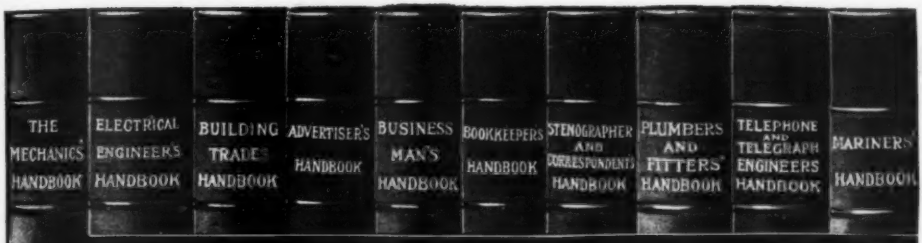

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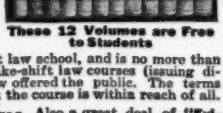

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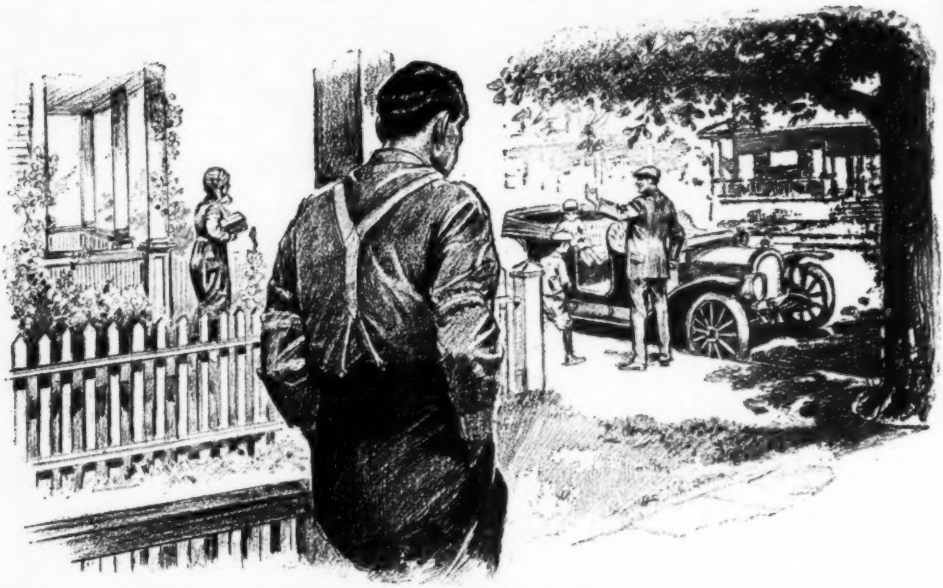

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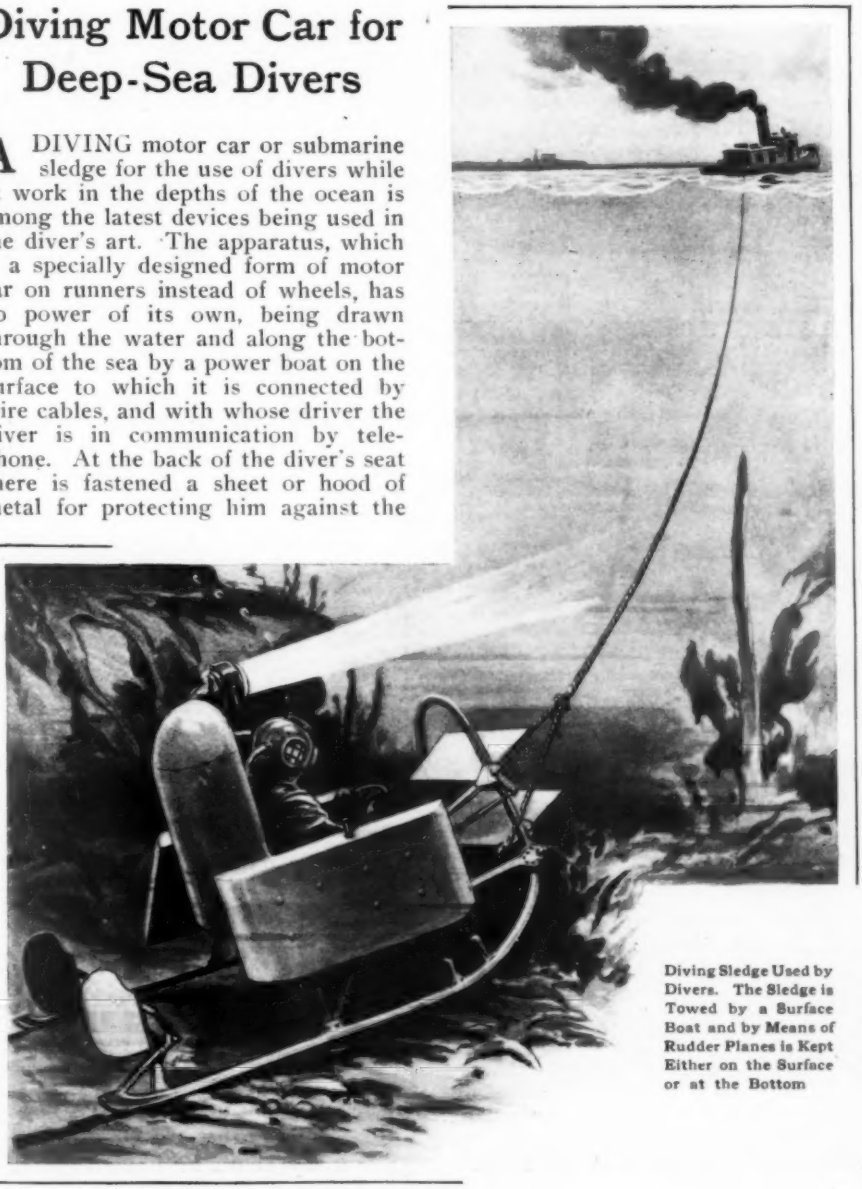
CHICAGO, U. S. A.

Popular Mechanics Magazine
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 19 FEBRUARY, 1913 No. 2

Diving Motor Car for Deep-Sea Divers

A DIVING motor car or submarine sledge for the use of divers while at work in the depths of the ocean is among the latest devices being used in the diver's art. The apparatus, which is a specially designed form of motor car on runners instead of wheels, has no power of its own, being drawn through the water and along the bottom of the sea by a power boat on the surface to which it is connected by wire cables, and with whose driver the diver is in communication by telephone. At the back of the diver's seat there is fastened a sheet or hood of metal for protecting him against the



Diving Sledge Used by Divers. The Sledge is Towed by a Surface Boat and by Means of Rudder Planes is Kept Either on the Surface or at the Bottom

swift currents that are formed when the vehicle is being drawn rapidly through the water. The diving car can be steered upward and downward, as well as in curves, by means of a steering mechanism operated by compressed air supplied from steel tanks attached to each side of the vehicle.

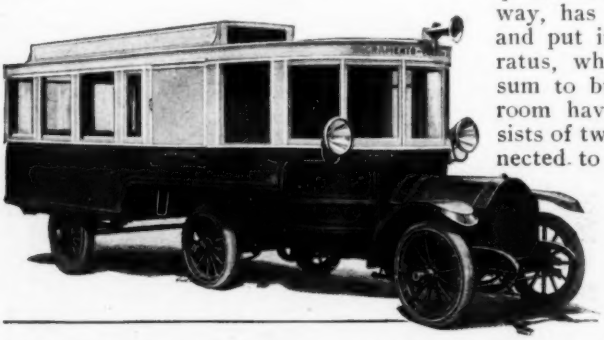
The diver, while operating the vehicle, wears a regular diving suit, the special feature of which is a tank or cartridge that, for a period of three hours, supplies the diver with fresh air. The submarine sledge is capable of being operated at a depth of about 130 ft. when the sun is shining, and uses a searchlight fed from the surface boat when artificial light is required. It weighs 500 lb. fully equipped.

The most striking possible application of the sledge is in the work of recovering sunken wrecks, or human bodies, the exact location of which can only be determined by a thorough search of a large area of river or sea bottom. By towing the diver back and forth over the bottom, the search can be carried on with accuracy and in only a small part of the time which ordinarily would be required.

The sledge has already been used successfully at an average depth of 70 ft. in the inspection of a long intake pipe running out into salt water.

AUTO STAGE HAS SMOKING AND BAGGAGE ROOMS

An auto stage which holds 22 persons, and has a 3-ft. compartment for baggage in rear of the driver's seat, runs between Sacramento and Folsom, 20 miles from Sacramento. The entrance is through the rear end. The forward half of the seating division is for women while the back is the smoking compartment. The car is electrically lighted, and is operated by a 6-cyl. engine.



Auto Stage with Baggage and Smoking Compartments, Used in California

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¶A novel Deperdussin hydro-aeroplane is being constructed in England, the feature of which is said to be that there are to be no external wires.

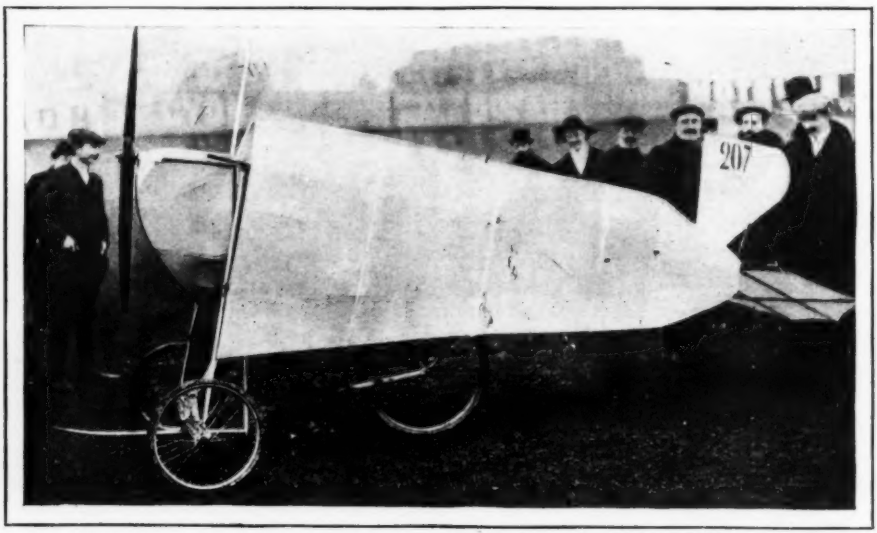
GROWING PLANTS INDOORS BY ELECTRICITY

A small electrical device, by which plants of all kinds can be fully grown indoors in about one-half the time required to raise them in the natural way, has recently been perfected and put in operation. The apparatus, which costs but a trifling sum to build and operate in any room having electric lights, consists of two small coils of wire connected to the lighting circuit and also to another coil of larger wire surrounding a wooden frame. Within this frame are mounted several shelves upon which are placed boxes containing the seeds and plants to be forced. When the current is turned on the space within the wooden frame is violently agitated by electric discharges of high frequency. This action causes the seeds and plants to grow with great rapidity and, in many instances, to reach a size not attainable under natural conditions. The treatments are given several times a day, each period being about one-half hour in length, and the compactness of the entire apparatus makes it possible to grow many plants in a small space.

LOOKING DOWN ON THE FIRE-CONTROL SQUAD

An unusually interesting view of the basket mast of one of our powerful battleships, with the Stars and Stripes flying, and several men in the top, is here shown. This type of mast is designed to stand up against persistent attack, as in battle the men in the top perform highly important work in range finding and fire control.

AVIETTES GROWING UP FROM BICYCLE MODELS



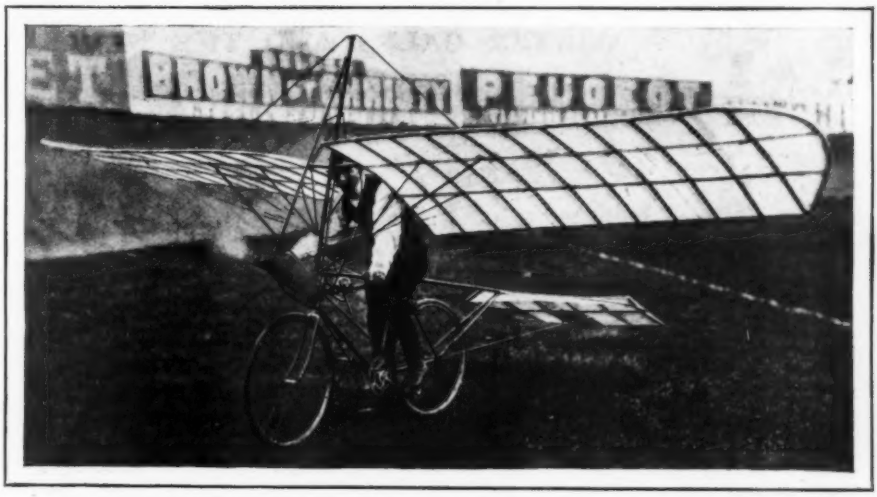
Instead of Usual Planes, This Aviette has Planes Curved to Form a Tunnel, within Which the Rider Sits

Aviettes, machines for attempting manflight by man-power alone, are rapidly evolving from ordinary bicycles with wings attached to machines designed on aeroplane and not on bicycle principles. The successful aviette is still to be built, although a forward step in the solution of the problem was shown at a recent competition in France, when one competitor succeeded in gliding over two wires about 4 in. high, set 39 in. apart. To demonstrate that the successful glide was not due to prevailing wind, the competitor had to make another glide over the obstacles in the opposite direction.

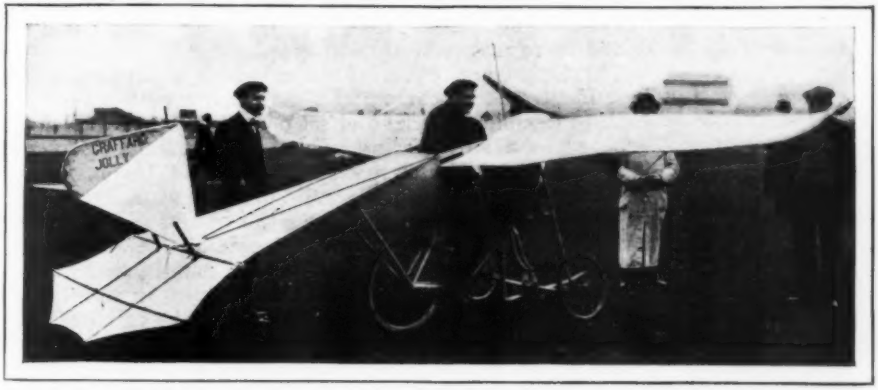
Aviette with Jointed Wings, the Wings being Lowered to a Flying Angle When Sufficient Speed has been Attained by Ordinary Bicycle Propulsion

Most of the contestants used the bicycle method of pedaling, the power being transmitted to a propeller by a chain; some had the chain drive applied both to a propeller and to the rear wheel of the cycle frame, so as to obtain speed forward either on the ground or in flight, but most of them depended entirely on getting up a speed by the bicycle method and then trying to glide. The accompanying illustrations are of machines which competed in the recent French contest.

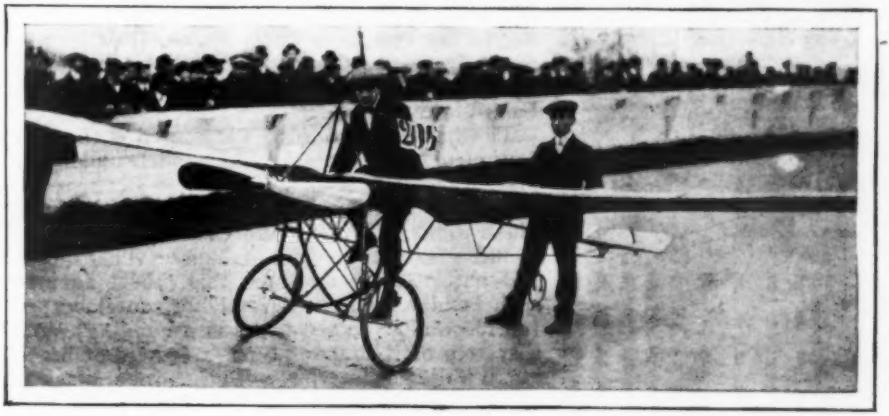
¶An improvement has been made in the registering fare boxes used to a considerable extent on pay-as-you-enter cars that makes them available for the deposit of tickets as well as coins. The tickets enter a separate slot, fall on a ticket-examination plate, and pass through a canceling mechanism into a locked compartment.



Power to the Propeller and to the Rear Wheel, Either of Which can be Cut Out

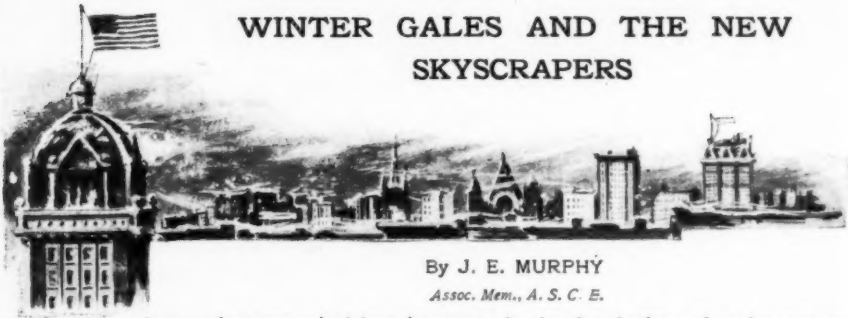


Aviette with Aeroplane Lines, with Power Transmitted both to the Rear Wheel and to a Propeller



Power Transmitted Only to a Propeller

WINTER GALES AND THE NEW SKYSCRAPERS

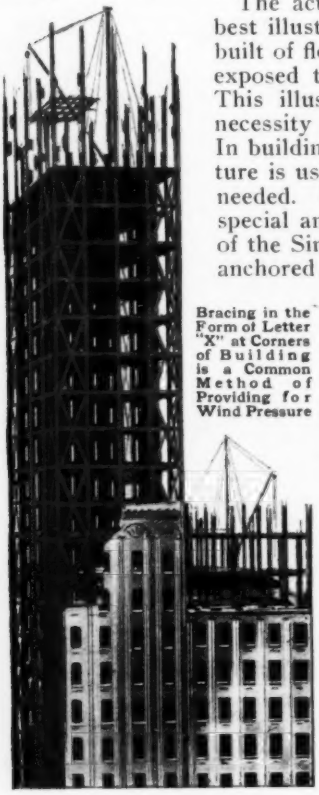


By J. E. MURPHY

Assoc. Mem., A. S. C. E.

HOW serious a feature wind bracing may be in the design of a skyscraper is indicated in the plans for the office section of the new Grand Central station in New York City. The cornice of this building will be 450 ft. above street level, and the wind pressure allowed for on each of the long side walls is 900 tons.

While the study of wind stresses and the design of proper bracing are complex matters requiring the use of higher mathematics, the principles of the problem are easily understood. In calculating wind stresses the building is considered as a vertical cantilever. Anyone who has used a spring board in diving is familiar with cantilever action. Take the spring board, set one end firmly in the ground, and there is a vertical cantilever.



Bracing in the Form of Letter "X" at Corners of Building is a Common Method of Providing for Wind Pressure

The action and effect of the wind on a skyscraper is best illustrated by comparison with that on a box model, built of flexible material and set on end. Such a model, if exposed to a strong wind, would immediately tip over. This illustrates the first element in wind bracing—the necessity for anchoring the building against overturning. In buildings of large ground area the weight of the structure is usually great enough to provide all the anchorage needed. But in very high buildings of small ground area special anchorage is an absolute necessity. In the tower of the Singer building in New York City the columns are anchored by heavy steel bars that extend downward 44 ft. into the concrete piers. The 42-story Smith building, now being built in Seattle, will be anchored to the concrete piers by hundreds of steel rods, each 5 in. in diameter, and extending to the bottom of the concrete 70 ft. below street level. When completed, this building will be like a hollow iron post driven one-fifth of its length into the ground.

The next feature to be considered is the distortion of the building. The model, under the pressure of a strong wind, would be bent to some such position as that shown in one of the illustrations. This, in the case of a building, would mean immediate collapse. The direct and natural way to brace this model against such bending is by means of horizontal beams (corresponding to the floors in a building), and a system of X-braces. Such a system of bracing, if it did not interfere with the proper placing of window openings, would evidently be the most economical and effective means of brac-

ing a skyscraper against wind pressure. Systems of bracing that are of different form but accomplish the same purpose, are generally used.

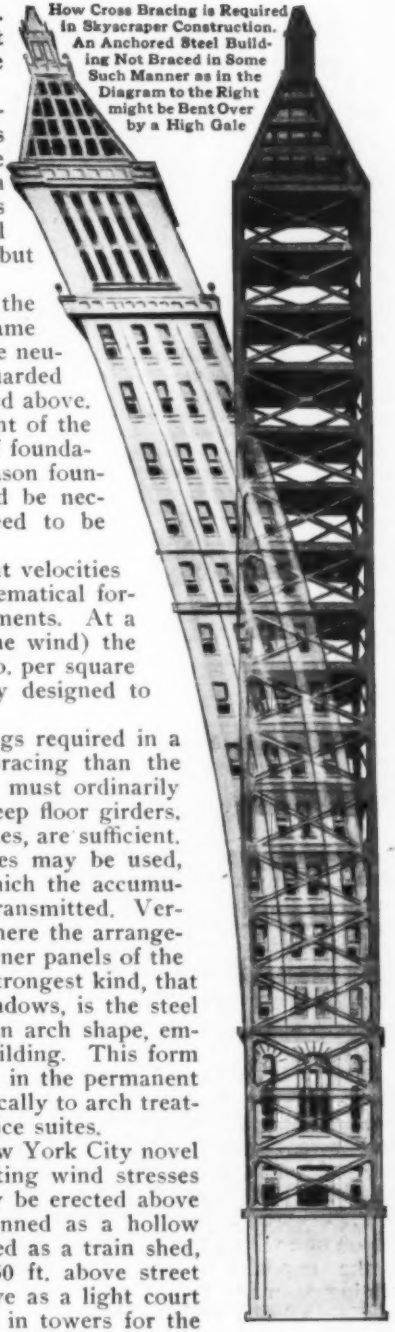
With the model anchored against overturning and braced against bending, there is still another danger to be considered. The entire structure may slide horizontally on its foundation. In technical language this is known as shear. Shear must be provided for, not alone in the foundation anchorage, but in every detail of the building.

Every pound of pressure acting against the building is transmitted through the steel frame to the foundation, where the stress must be neutralized. Uplift of the windward wall is guarded against by means of anchorage, as explained above. But under such conditions the entire weight of the building may be concentrated on one set of foundations under the leeward wall. For this reason foundations are invariably heavier than would be necessary if the effect of wind did not need to be considered.

The pressure per square foot for different velocities of wind is computed by means of a mathematical formula derived from a long series of experiments. At a velocity of 100 miles per hour (a hurricane wind) the pressure, according to this formula, is 30 lb. per square foot, and buildings are almost universally designed to resist this pressure.

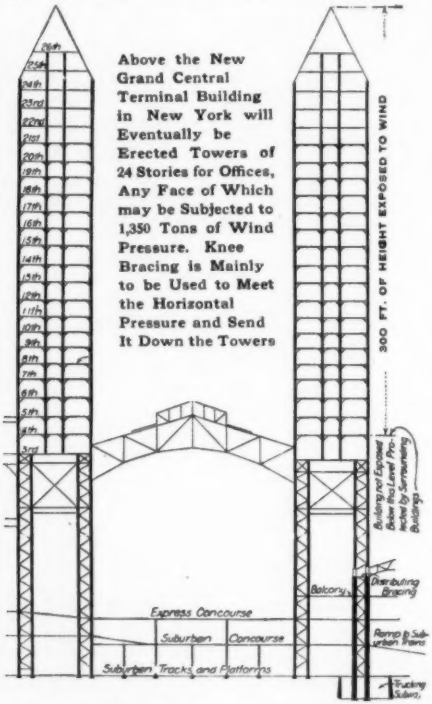
Owing to the numerous window openings required in a modern office building other forms of bracing than the simple X-bracing, shown in the diagram, must ordinarily be employed. In the majority of cases deep floor girders, connected to the columns by means of plates, are sufficient. If heavier bracing is required, knee braces may be used, especially in the lower floors, through which the accumulated stress from the upper floors must be transmitted. Vertical X-frames are often used in panels where the arrangement of windows will permit, as in the corner panels of the Singer tower. A form of bracing of the strongest kind, that does not interfere with the placing of windows, is the steel portal construction, or braces that have an arch shape, employed in the tower of the Woolworth building. This form is used not only in the exterior walls, but in the permanent walls of the interior as well, and leads logically to arch treatment in the corridors and entrances to office suites.

In the new Grand Central station in New York City novel methods are to be employed for distributing wind stresses on the office towers which will eventually be erected above the main building. This building is planned as a hollow rectangle. The inclosed space will be used as a train shed, and will be roofed at an elevation of 150 ft. above street level. Above the roof the space will serve as a light court for the office section. Columns, grouped in towers for the



How Cross Bracing is Required in Skyscraper Construction. An Anchored Steel Building Not Braced in Some Such Manner as in the Diagram to the Right might be Bent Over by a High Gale

purpose of leaving the lower space as free as possible from obstructions, will support the upper or office portion of the building. Above this an ordinary system of column and beam construc-



tion is used, the two interior rows of columns being carried on girders supported by the towers. A section of this structure looks like a building set on stilts, and it is apparent that the danger point is at the junction of the two systems of construction. To guard against weakness at this point, the tops of the towers are tied together and braced by heavy steel trusses. "Wind girders" extend from tower to tower in every direction and serve to distribute the wind stress evenly among all the towers of each wing. In addition to this, the roof trusses of the train shed are so designed as to transmit the pressure on one wing across the light court to the opposite wing. The entire building is made to act as a unit in resisting wind pressure.

SMALL-APARTMENT RENTER NOT POPULAR

Although large rentals are sometimes paid for two and three-room suites in select locations in New York and Chicago, builders are disinclined to construct this type of apartment house because the tenants found in smaller suites usually possess but few household goods and are constantly moving from place to place. For this reason the present demand for apartments containing six rooms, and upward, is a source of satisfaction to the owners who have had to contend with the floating population of small-flat dwellers, or "American Bedouins." The demand for larger apartments is probably due to the fact that business generally is on a much sounder footing now than for several years past, consequently tenants are able to pay higher rentals and live in more commodious homes.

CHECKS AND BANK NOTES THAT SPEAK

Making checks or bank notes that are capable of speaking is one of the latest precautions against forgery that has been invented. The note is given the power of utterance by applying to its edge a "pictorial" record of perforations representing some prearranged phrase. When the prepared note is placed in a phonograph the phrase is reproduced in the presence of the person who has questioned the genuineness of the note.

THREE-HORSEPOWER CENTRAL ELECTRIC STATION

Although Sacramento, Neb., has at present a population of only a dozen inhabitants it is progressive enough to maintain a central electric station, which, no doubt, is the smallest in the United States. The plant is operated by a 3-hp. coal-oil engine. The total connected load consists of 30 metal-filament lamps.

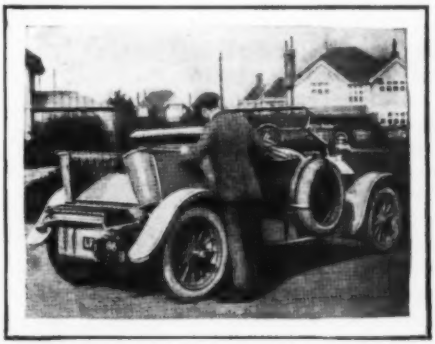
Moving a railroad station on a flat car in Kansas, as part of the moving of the town itself. The original location of the town of Cold Springs proved to be inconvenient after the development of industries at South Cold Springs and a removal was found advisable.

ST. LAWRENCE RIVER TO BE KEPT OPEN

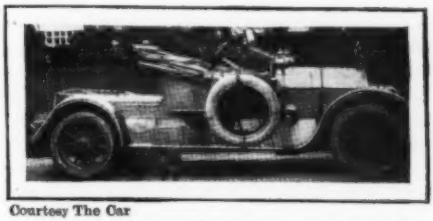
An attempt to keep the St. Lawrence River in Canada open during the winter for the passage of vessels between St. John and Quebec will be made by the Canadian government. The marine department has ordered one of the St. Lawrence ice breakers to make monthly tests during the cold weather and endeavor to maintain an open channel for traffic plying from one port to another by way of Anticosti and Seven Islands.

NOVEL COLLAPSIBLE BODY FOR AUTOMOBILES

Attention has been drawn to several makes of automobiles of the two-in-one type, but these have been of the detachable-body species, while this automobile has a convertible collapsible body. With the exception of two small hinged pillars, nothing whatever is detachable on this car, the change from a five-seated touring car to a gentleman's roadster being accomplished by folding down the back portion of the body, which is composed of three hinged panels, the rear panel folding down underneath the two side panels. A folding grid prevents the panels from being scratched or otherwise damaged when the car is used as a roadster and luggage is being carried.



Collapsing Rear Part of Five-Seated Touring Car to Convert into a Gentleman's Roadster



Courtesy The Car

Roadster Formed by Collapsing Rear Part of Car

AN ELECTRIC-WIRE FATALITY

One of a number of men working on an electric line at Los Angeles came in contact with a high-voltage wire on one of the poles and was almost instantly killed. The illustration is a reproduction of a photograph taken while his companions were lowering him to the ground for resuscitation treatment.

Death by Contact with a High-Voltage Wire

FIRE AT THE BANK OF ENGLAND

An alarm of fire at the Bank of England recently sent a thrill through every fire station in the city of London. A few minutes after the alarm was received, which was about 10 o'clock in the evening, three fire engines and four salvage wagons were in Threadneedle street. As the firemen leaped from their seats and rushed through the open doors of the bank, the soldiers, who are on duty at the bank every night, marched out with fixed bayonets and formed a line on each side of the street in front of the building.

Although the vicinity of the bank was practically deserted at this time of the night, omnibus passengers and pedestrians from every direction hurried to the scene when they heard that the famous bank was on fire. In a few moments an excited crowd had collected, but the soldiers and the police kept the mob at a safe distance from the doors of the bank. Soon a fireman came rushing out of the building and shouted that the fire was not a serious one. This information was quickly passed around, but the unusual sight of the fire engines and soldiers outside of the bank, and the firemen rushing through its doors, kept the crowd from dispersing. The officer in command of the soldiers strode anxiously up and down the street as the excitement continued. In 20 minutes, however, the fire had been put out, but the crowd did not begin to leave the scene until midnight. The fire, which had burned part of the floor of the clerks' room, was probably caused by the overheating of a steam radiator, and was extinguished by the bank's own fire apparatus.

The Bank of England has been under military protection every night since the Gordon riots of 1780, when metal inkstands were melted into bullets and used in defense of the bank.

AUSTRALIA HAS TALKING SIGN IN LONDON

On the building of the Australian Commonwealth in London is an electric-light "talking" sign, by means of which Australia gives to London each night a message which she feels the mother country should see. The daily messages so displayed can be read at a considerable distance.

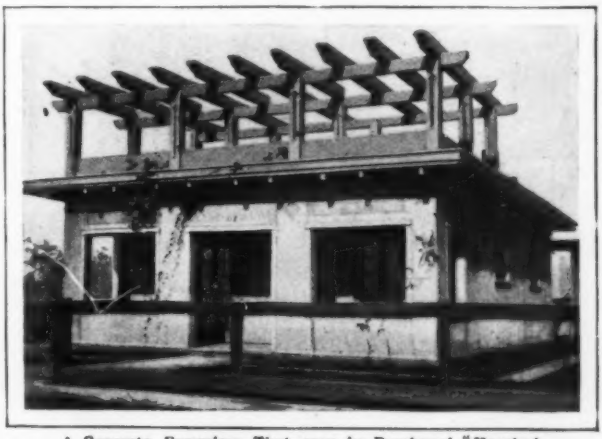
¶One of New York's largest boarding stables has been converted into a garage accommodating more than 300 automobiles.

ENORMOUS GAS HOLDER FOR BALTIMORE

An enormous gas holder has just been completed and put into commission in Baltimore. The holder is over 222 ft. high and about 224 ft. in diameter at its base, and the water tank in which the holder floats has a capacity of 10,500,000 gal. of water, or enough to form a fair-sized lake upon which two rowboats are kept constantly. The distance around the base of the structure is about one-sixth of a mile. Over 6,000,000 lb. of steel were required to build the structure, which has seven stairways and two steel ladders leading from its base to its top. The holder has a capacity exceeding the combined capacity of all other gas holders in Baltimore and was designed to withstand the pressure of a wind blowing with a velocity of 100 miles an hour. The foundation was laid last May and the structure was completed six months later.

"KNOCKDOWN" CONCRETE BUNGALOW

This little concrete bungalow, invented by a concrete contractor of El Paso, Texas, and used by him as a residence, is of the "knockdown" variety. Each concrete slab of the house is tongued and grooved so that they may be easily put together, each piece, of course, being numbered. The bathtub, toilet, sinks, flower pots, and the like, are concrete. There is not a stick of wood in the entire structure.

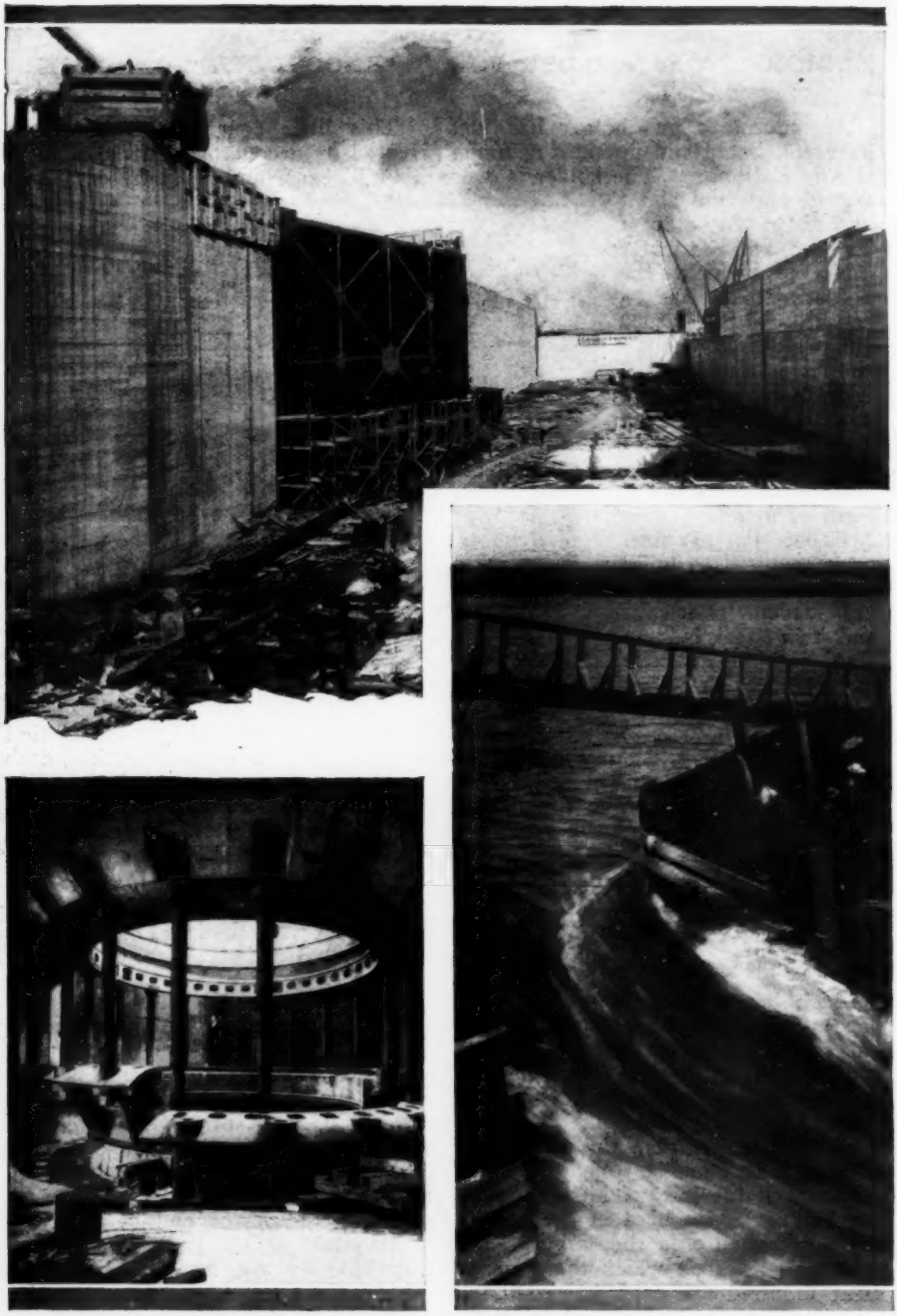


A Concrete Bungalow That may be Purchased "Knocked Down" and Set Up in Any Part of the Country

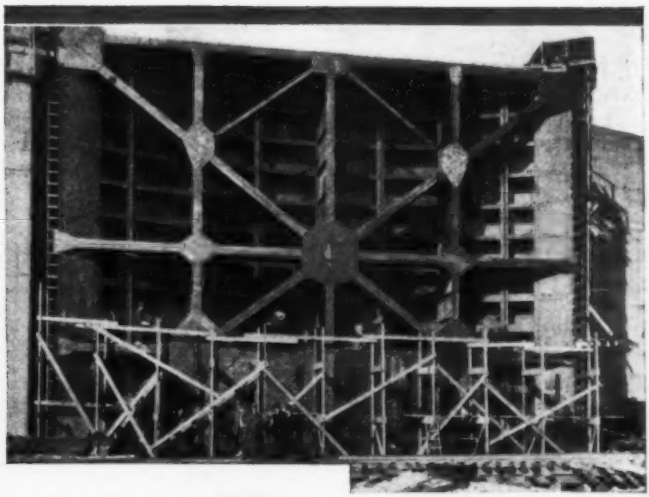
HARNESSING THE MISSISSIPPI FOR HYDRO-ELECTRIC POWER

Much has been written about the harnessing of the Mississippi at Keokuk for the hydroelectric generation of 200,000 hp., but it has been difficult to impress the fact upon people that some of the things done in this undertaking are bigger than the same kind of things at Panama. Yet, the dam that now harnesses the Mississippi is the biggest of its kind in the world, the power house is the largest ever built, and the lock which the government required the engineers to build around the dam is bigger than those of the Panama canal, and the drydock alongside is large enough to accommodate practically all the steamboats that were navigating the upper Mississippi last fall.

The Gatun lock at Panama is considered an exceptionally big engineering achievement of its kind, yet the Keokuk lock is just as wide (110 ft.) and has a lift of 40 ft., whereas the lift at Panama is 28 ft. 4 in. The steel gates at the lower end of the lock weigh 1,000,000 lb. each, and are so thick that two wagons could pass each other on the top edge. Some special means were necessary to keep these gates from sagging, so they contain air-tight buoyancy chambers about 12



Upper Left-Hand View—Looking North through the Big Lock as It Appeared Last November. Lower Left-
the Million-Pound Gates for the Lower End of the Lock. This Gate Contains Airtight Chambers, to Prevent
Lower Right-Hand View—The Rush of Water through This Uncompleted Section of Cofferdam



Rush of Water through Channel between the Cofferdams

Hand View—Setting the Lower Foundation Ring in One of the Power Units. Upper Right-Hand View—One of Sagging under the Great Weight. The Water Pressure against These Gates, When Closed, is 6,500,000 Lb. Gave the Crew of Lumberjacks Considerable Trouble before the Channel could be Finally Closed

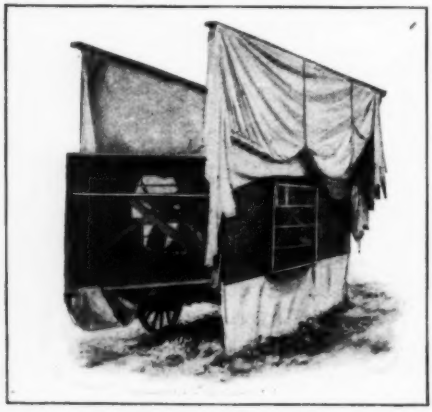
ft. high and 32 ft. long, which tend to float them. The heel of each gate is a hollow hemisphere of nickel steel resting over a hemisphere of bronze.

Many problems were met and overcome, some in novel ways, in this vast construction task. The building of a cofferdam was one of these. Just before the ice formed last winter a crew of hardy, experienced lumberjacks came from the northern forests to put the last bit of harness on the Mississippi. These men, chosen for their skill in handling heavy timber in swift water, were detailed to work on the last section of the cofferdam which was to protect the dam forms until all the concrete was in place and the whole structure solidly united. The dam had been completed from the Illinois shore to within 100 ft. of the power house, on the Iowa side, and the water was several feet higher above the dam than below. It rushed through the 100-ft. gap with a force that snapped big timbers in two or jerked them out of the control of the crews. In spite of previous experience, many of the lumberjacks were subjected to chilly baths before the placing of the crib sections was successfully ended.

One of the big mechanical things accomplished is the installation of the hydraulic plant in such a manner that an efficiency of 86 per cent is attained, which is nearly 20 per cent more than the indicated rating. In a power house built of concrete, a third of a mile long, half as wide as a city block, and having a height, from the lowest chamber to the top, said to be as great as that of a 20-story office building, are set 30 power units, consisting of turbine and generator, on the same vertical shaft with four auxiliaries. Four intakes, converging into a scroll chamber 39 ft. in diameter, with a spiral floor, lead to each turbine, the walls and floor of each scroll chamber being so shaped that the water strikes every point of the circumference of the turbine with equal velocity and force. The water is thus given a rotary motion before it even hits the wheel, and this is held to be largely responsible for the high efficiency.

CATCHING GRASSHOPPERS WITH SUCTION WAGON

Although this queer-looking contrivance has a gasoline engine, two 4-bladed wooden propellers, and two broad canvas wings, it is not an aeroplane. It is a pneumatic grasshopper catcher, and an exceptionally efficient one at that, designed for use in a California vineyard. The box, mounted on wheels, has a large circular opening on each side, covered with coarse screen having a mesh through which grasshoppers can pass, but small enough to exclude leaves and other debris. It is in this opening, just back of the screens, that the propellers or fans are mounted. The vehicle is driven between the rows of grapevines, the canvas wings being extended so as to brush against the vines. The grasshoppers, being thus disturbed, fly up under the canvas, and the suction created by the propellers draws them into the box.



An Effective Machine for Ridding Vineyards of Grasshoppers

¶A large railroad company in the south is equipping all the hand cars upon its system with gasoline motors.

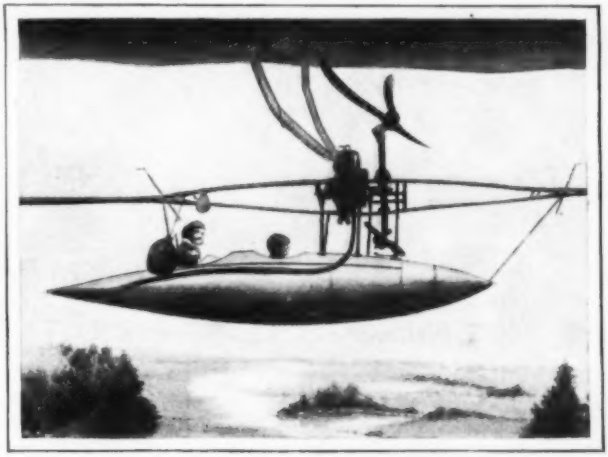
MINE TELEPHONE OPERATED BY THROAT VIBRATIONS

A new type of mine telephone, by means of which a conversation is transmitted from the outside of the throat instead of from the mouth, is being tested by the United States Bureau of Mines. The device appears to have solved the problem of establishing means of communication between the men on the outside of a mine and the rescuer when he is wearing the recently adopted mouth-breathing apparatus, which does not give the operator any freedom of the lips, and which it is claimed will soon displace the oxygen helmet now used in rescuing imprisoned miners. The transmitter of the newly devised telephone is so constructed that it can be placed in direct contact with the throat and operated by the vibrations of the vocal cords. The two receivers of the telephone are held in position against the ears by means of a strap, and to overcome the difficulty of clearly transmitting certain consonants, such as "m" and "p" when pronounced with the lips, a special code of numbered words will be used. The new type of mine telephone also possesses another distinct advantage over the oxygen-helmet telephone, in that it can be removed from the throat of the bearer and used by another member of the rescuing crew in the mine in case the former is disabled while moving about the interior passageways. In this manner the outside reserve corps can be notified if an accident occurs to the man who went into the mine with the telephone.

¶Germany is planning an aerial war fleet composed of 20 Zeppelin airships.

BRITISH DIRIGIBLE WITH TORPEDO-SHAPED CAR

A new British army dirigible, called the "Baby" because of its small size compared with other dirigibles, has a car rather original in construction, and two four-bladed propellers so mounted that they may be set at an angle which will give them a lifting power to aid in causing the airship to ascend rapidly.



Small Dirigible with Streamline Car and Adjustable Four-Bladed Propellers

The car, which is of streamline shape, has separate compartments, or cockpits, for the pilot and his mechanician. The dirigible is driven by a 35-hp. engine.

PERAMBULATING SIGNS ARE TRAFFIC-REGULATED

The number of sandwich men or "perambulating signs" in Lyon, France, is so large that traffic has often been impeded by them, particularly on windy days, and as a result, special traffic regulations have been issued. The most drastic feature of these regulations is the prohibiting of perambulating signs in the business district on days when there is a high wind. The "signs" may walk on other days, provided that they are not more than 4½ ft. high and 5 ft. wide.

BUSINESSLIKE COSTUME FOR FEMININE CLIMBERS

Alpine climbing is sufficiently indulged in by women in Europe to warrant the keeping on hand of a stock

A "Free and Easy" Costume for Feminine Alpine Climbers

of climbing costumes in the fashionable stores of such cities as Berlin, Paris, London and Vienna. An exceedingly smart model is here shown.

AN AERONAUT EXPLODES HIS BALLOON WITH DYNAMITE

An unusual balloon-ascension feat was carried through successfully in New York recently by Rodman Law. He made an ascent to a height of about 500 ft. above the Hudson River in a balloon filled with superheated naphtha gas, then blew the balloon up with dynamite, and dropped with his parachute into the water, where he was picked up by a tugboat.

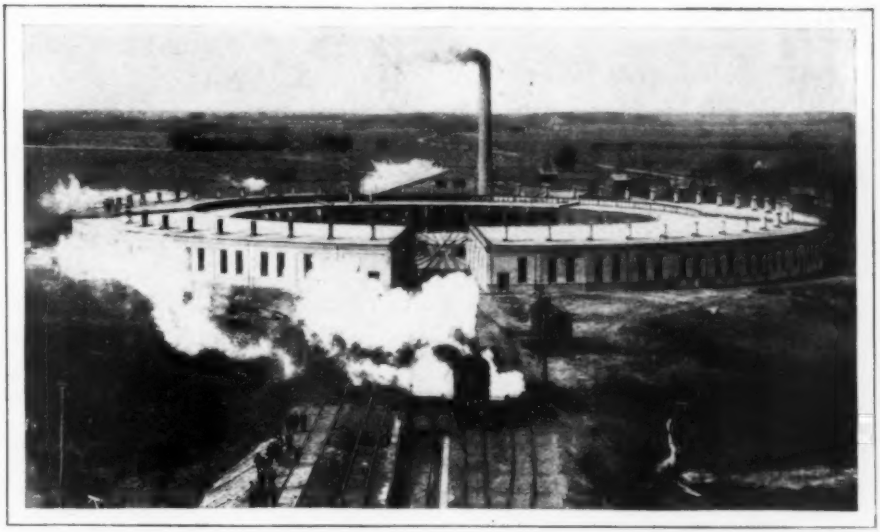
The aeronaut was clothed entirely in knit woolen garments, because wool will not catch fire easily. Under his woolen hood was a football-player's helmet, and a thin woolen veil protected his eyes. He sat on a crossbar beneath the balloon, and exploded the dynamite by pulling a trigger string. The explosion was followed by a cloud of flame, which gave place to a dense black smoke, and from the debris the aeronaut was seen descending under the parachute.

RAILROAD FURNISHES STUMP PULLERS TO FARMERS

In order to increase the acreage of agricultural land adjacent to its tracks, the Duluth, South Shore and Atlantic Railway, which operates through extensive areas of land from which timber has been removed, is loaning stump pullers to the farmers. The machines are loaned for the very nominal rental of $1 per acre cleared, on condition that the farmers taking advantage of the loan, work together, turn about, on each other's land as rapidly as possible. A penalty is imposed for all days on which the stump pullers are idle for other reasons than adverse weather.

A PAINT THAT SIGNALS EXCESSIVE HEAT

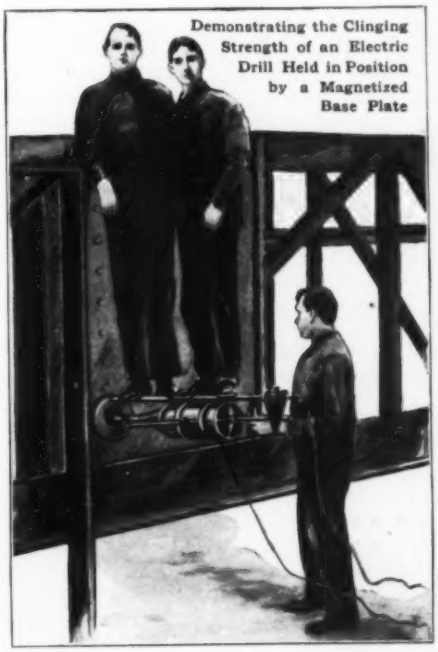
A paint that is a bright red in color at ordinary temperatures, turns black when the temperature rises to 120 deg. F., or thereabout, and then resumes its red color when cool again, has been recently introduced. This paint is especially suitable, for instance, as a coating for bearings, as it will show that a bearing is commencing to heat before there is danger of damage resulting. The color changes are said to be unmistakable, the paint is unaffected by lubricating oils, and is also free from alkalis or acids.



A roundhouse that is really round is here shown. It is the monster stable for the big freight locomotives of the Northwestern Railroad in the Proviso yards, just outside of Chicago. It will house 58 locomotives. Warm air is circulated through this roundhouse by means of underground ducts which discharge air into the locomotive pits.

ELECTRIC DRILL HELD IN PLACE BY MAGNET

A remarkably simple and ingenious method of holding an electric drill in place against the structural steel being bored, is shown in the illustration. This electric drill is provided with a ring-shaped soft-iron base plate, which is magnetized by the same current that drives the drill, and holds the tool firmly in place against the piece to be bored, no matter in which position the drill is applied. The magnetic strength of the base is well demonstrated by the fact that it clings solidly in position with two men standing on the drill.



Demonstrating the Clinging Strength of an Electric Drill Held in Position by a Magnetized Base Plate

¶The two-cent postage stamp forming one of the special series of four stamps to be issued in connection with the Panama-Pacific exposition, has a design showing a merchant steamer emerging from one of the Gatun locks, and a warship in the other.

MOLDING LEAD INTO WORKS OF ART

Art leadwork is being designed and worked out by the leadworking class of a trade school. The original designs are modeled in clay; from these are made plaster models, upon which a coating of lead is placed to make the finished article. There appears to be a growing desire on the part of plumbers to know more of this interesting art, for the acquiring of which but very few chances exist in the ordinary practice of plumbing.

Panel of Art Leadwork

TERRIFIC SPEED MADE BY AUTOMOBILE

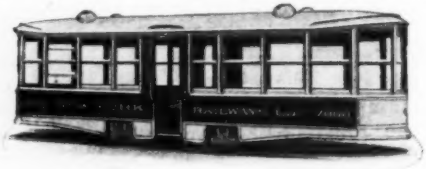
The astonishing speed of almost two miles per minute was recently made by an automobile during a race in England. The car, which was equipped with a 25-hp. engine, attained a speed of more than 113 miles per hour during the first half mile, and covered a mile at the rate of about 111 miles an hour. The chassis of the car was practically of stock construction, except that the engine had lighter pistons and connecting rods.

SIMPLE WAY TO TEST IMPORTED TEAS

A remarkably simple method of testing the purity of imported teas has been adopted by the government and may be used with equal success by anybody. The testing is done with the aid of an ordinary table knife and a sheet of white paper, upon which a small quantity of the tea to be tested is placed. The tea is then rubbed in with the knife. When the leaves have been reduced to a powder the paper is dusted clean with a brush made of common bristles and its surface examined with the naked eye or a microscope. If the tea is artificially colored, little spots or streaks of vivid Prussian blue will appear in the fiber of the paper. These stains are so distinct in their coloring that they cannot possibly be confused with any other stain that may be in the paper.

STEPLESS STORAGE-BATTERY CARS FOR NEW YORK

To improve the service efficiency on crosstown lines and reduce the cost of operation, the New York Railways Company has had built an experimental storage-battery car of the new stepless type. The stepless feature of the car, the floor of which is only 10½



A Stepless Storage-Battery Car Designed for Crosstown Service in New York

Courtesy Boston Transcript

The Beautiful "Bookless" Library of "Castlegould," Howard Gould's Wonderful Country House on Long Island

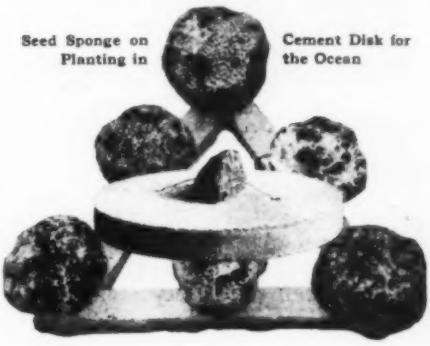
in. above the track at the central doors, is obtained by gradually sloping the floor downward from the ends to the center. The lower level of the car necessitates the projecting of the wheels through the floor, and the objection to such an arrangement is overcome by placing a seat directly over the opening. The center stringers of the car just clear the axles. Due to the fact that this form of construction is impossible with a separate truck for the wheels, the underframe is ingeniously designed to serve as a truck frame as well.

THE "BOOKLESS" LIBRARY OF "CASTLEGOULD"

"Castlegould," the country home of Howard Gould at Sands Point, Long Island, which started out about eight years ago to be a copy of Kilkenny Castle, Ireland, has ended by being an exceptionally livable "country house" instead, with just a "suspicion" of an old Irish castle remaining. One of the most interesting rooms is the library, which many writers mention as "bookless." The bookshelves, which are few, are concealed in an alcove, which may be shut off as a cosy study.

SPONGE FARMING IN THE OCEAN

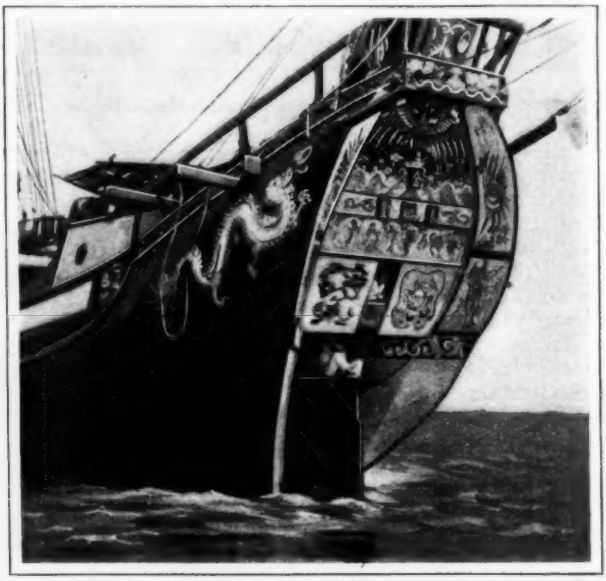
The cultivation of sponges upon the bottom of the ocean is accomplished by means of cement triangles or disks, to which the "seed" sponges are attached with a piece of lead-coated cop-



per wire, as shown in the illustration. After the seed sponges, which are obtained by cutting one large sponge into several pieces, have been fastened to the cement disks, these are let down with a strand of wire, or dropped down if the water is shallow, to rest on the bottom. Here they are permitted to remain for a year or two, until satisfactory growth has been attained, when they are hooked up from the bottom by men in a boat. If the water happens to be very deep, a number of divers are employed for putting new cuttings on the disks as they take the full-grown sponges off. It is claimed that cultivated sponges have at least one important advantage over those taken from their natural growing places, in that the former can be removed from the cement disks or triangles without damaging the texture and wearing qualities of the sponges—a result that it is impossible to obtain when they are detached from their rocky or coral foundations.

LARGE CHINESE "JUNK" FOR PANAMA EXPOSITION

A 225-ton Chinese "junk" is sailing from Woosing, near Shanghai, to San Francisco for the Panama-Pacific exposition. This craft is a masterpiece of Chinese shipbuilding. The beauty of its decoration is clearly shown in the illustration. From bow to stern the costliest wood is used, and the inlay and carving are exceptionally beautiful.



A Masterpiece in Chinese Shipbuilding That is Sailing across the Pacific Ocean for the Panama Exposition

USING ELECTRICITY IN EXCAVATION

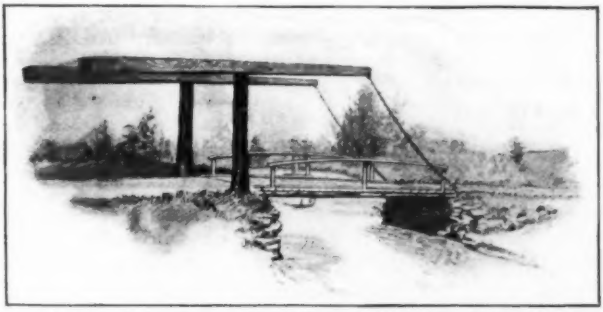
Electricity is destined to play a most important part in excavating operations according to the rapidity with which this form of motive power is being applied to various uses in this field since the problem of adapting the electric drive to excavating machinery has been solved. The use of electrically driven machinery will doubtless supersede steam to a very large extent, as all the troubles experienced in operating an engine and boiler will have been eliminated, besides which a considerable saving in operating expenses will be effected, as the electrically driven machine does not require the attention of either a fireman or pumpman. As the type of electric motor used for this class of service is built to withstand heavy overloads for short periods of time, which is a characteristic that is absolutely necessary in operating excavating machinery, it is not improbable that the electric drive will, under test, accomplish more work than the steam engine in a given time.

OILING LOCOMOTIVE WHEEL FLANGES WITH SPRAY

Excessive flange wear on the wheels of the electric locomotives used to draw trains through the tunnel under the St. Clair River from Port Huron, Mich., to Sarnia, Canada, has been overcome by an ingenious spray system of oiling. Previously, when these locomotives, which are required to handle 1,000-ton trains on the two-per-cent grade, were on the down grade, the application of the brakes made the tires so hot that grease could not be used. Now, all that is necessary when the flanges require lubricating is to press an electric button in the cab, and the tire is sprayed with oil and air, which both lubricates and cleans the flanges of dirt.

BALANCED-BEAM BRIDGES OVER ENGLISH CANAL

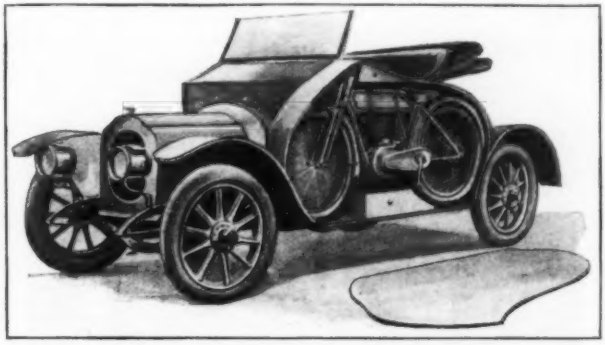
On a beautiful and not too frequented automobile road between Stony Stratford and Towcester, England, which skirts a canal for three or four miles, may be seen a number of curious drawbridges spanning the canal at intervals. These drawbridges are all of the balanced-beam type.



Balanced-Beam Drawbridge Which may be Lifted by Hand

AUTOMOBILE FITTED TO CARRY BICYCLE

A Scotchman who lives in a hilly portion of his country is so enthusiastic for bicycling that he has especially fitted his automobile for the transportation of the bicycle, and makes trips of a hundred miles or more in it to find stretches of country where wheeling is possible. The running board on one side of the automobile carries a canvas case shaped so as to just take the wheel and hold it securely.



Showing Position of Wheel in the Case

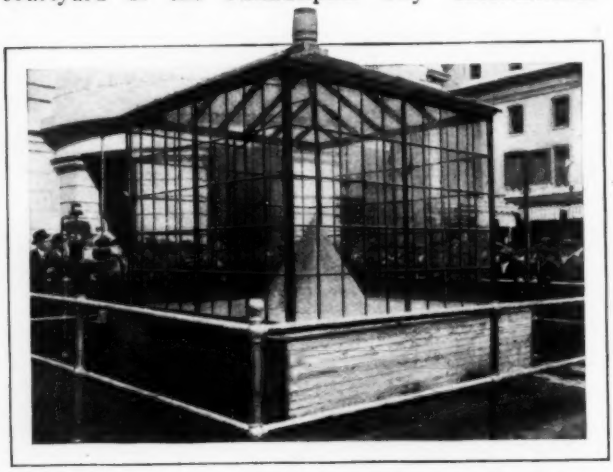
A TREE THAT OWNS ITSELF

A giant oak tree in Athens, Ga., holds the unique distinction of owning itself. About 20 years ago, Col. W. H. Jackson had a deed made out which read as follows: "For and in consideration of the great love I bear this tree, and the great desire I have for its protection for all time, I convey entire possession of itself and all land within eight feet of the tree on all sides to it."

The tree, and the eight feet of ground on all sides of it, is inclosed with a heavy iron chain.

AUTOMATIC FIRE-SPRINKLER DEMONSTRATION

Among the features of a recent water-conservation exhibit, held in the courtyard of the Philadelphia City Hall, was a demonstration of the operation of the automatic-sprinkler method of fire protection. Within a railing was erected a house of wired glass with steel framework, with an automatic sprinkler placed in its top and connected with the city water supply. In making the demonstration, a conical structure covered with asbestos fiber was saturated and lighted. Within 15 or 20 seconds the heat fused the sprinkler head and a drenching downpour put out the fire.



A Demonstration of the Automatic Fire-Extinguishing Sprinkler

The reason given for demonstrating such an apparatus as part of a water-conservation exhibition is that it puts a fire out while it is small, thus saving the immense amount of water used by the fire department.

¶Sewer cleaners in Indianapolis found $26 in coins, and considerable jewelry, including two diamond rings, in an accumulation of rubbish held by an obstruction in the main sewer. It is believed these things found their way into the sewer in snow cleaned from the streets.

CHAMELEON EFFECTS FOR COMING DRESSES

That an august body of scientists such as was gathered at the recent International Congress of Applied Chemistry should concern itself with future fashions for women's dress may seem peculiar, but one of the most celebrated lecturers, Giacomo Ciamician, made predictions as to future fashions in regard to the colors used for wearing apparel. Women of the future, he said, will no longer be contented with a dress which remains constantly of one color, but will demand colors that change in harmony with their surroundings. Thus the color of the apparel may be changed without changing the dress. Passing from darkness to light the color would brighten up, thus conforming automatically to the environment—the last word in fashion for the future.

This prediction will come true as soon as chemists learn to understand better what are called "phototropic colors," or colors that change with the intensity of the light upon them. In men's wear this might mean that the light-colored suit of the bright summer day could be transformed into a dark suit at night.

THE MANHOOD DANCE OF THE AMAXOSA TRIBES

The greatest religious ceremony of the Amaxosa tribes, who inhabit one of the districts of Cape Colony, South Africa, is the "Araimasion," in which youths are admitted to the rights of manhood. The ceremony continues over a period of three or four months, the youths living in an isolated place

Courtesy The Graphic, London

Youths of an Amaxosa Tribe Costumed for the Dance Which Lands Them into Manhood

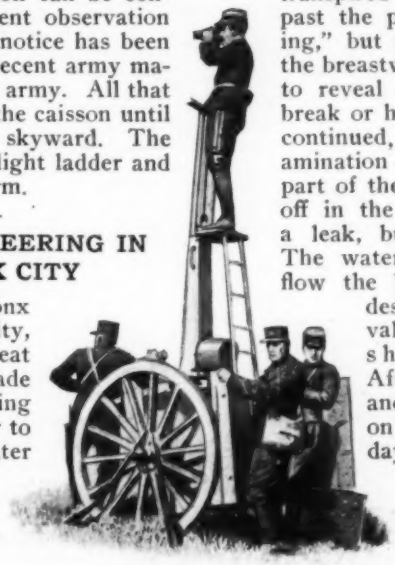
during this time. During the ceremony, of which the manhood dance is the chief feature, they hide their faces in a bundle of thatch, cover their bodies with clay, and wear skirts of plaited grass.

GUN CAISSON CONVERTED INTO TOWER

That the gun caisson can be converted into an excellent observation tower at a moment's notice has been demonstrated in the recent army maneuvers of the French army. All that is necessary is to tip the caisson until its long shaft points skyward. The shaft is fitted with a light ladder and an observation platform.

BEAVER ENGINEERING IN NEW YORK CITY

The beavers of Bronx Park, New York City, recently completed a feat of engineering that made necessary the emptying of their pond in order to discover why its water was overflowing the banks. When the pond was built, a 12-in. pipe was laid in the bed of the stream to carry off the surplus water, but the beavers were not pleased with the arrangement, according to events that transpired later. For some time past the pond had been "leaking," but a close inspection of the breastwork of the dam failed to reveal the presence of any break or hole. As the overflow continued, another careful examination of the dam was made, part of the water being drained off in the hope of discovering a leak, but none was found. The water continued to overflow the banks and began to destroy thousands of valuable plants and shrubbery near by. After the chief forester and his men had worked on the "mystery" for 10 days, the situation had become so serious that the dam was drained and a thorough inspection made. Within the center of

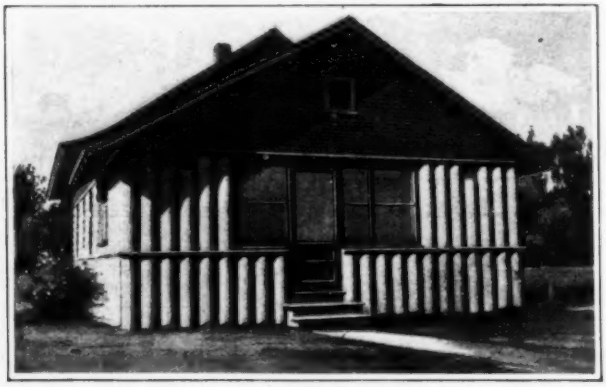


Using a Gun Caisson as an Observation Platform

the 12-in. drainpipe was found a sapling, about 3 in. in diameter and almost 4 ft. long, surrounded by numerous small branches, all of which were packed closely together and made water-tight with mud brought from the bottom of the pond by the little engineers.

BUNGALOW CONSTRUCTED OF IRRIGATION PIPING

By using concrete irrigation piping for the walls of his new bungalow, a resident of San Bernardino, Cal., has provided himself with a dwelling which may be water-cooled in the summer time. The sections of pipe are so connected that they may be filled with cold water.



A Water-Cooled Bungalow Having Walls Constructed of Concrete Irrigation Pipe

RAT-PROOF CORNCRIB FOR FARMERS

A new type of corncrib, that is rat-proof and possesses several other distinct features, consists of a concrete foundation for keeping the rats from entering through the floor, walls of wire screen to prevent their entrance through the sides and ends, and a tin roof to keep the rodents from dropping in from above. The new form of crib, which may be constructed by any farmer at small cost, makes it possible for the air to circulate through the corn better than does the old-style crib.

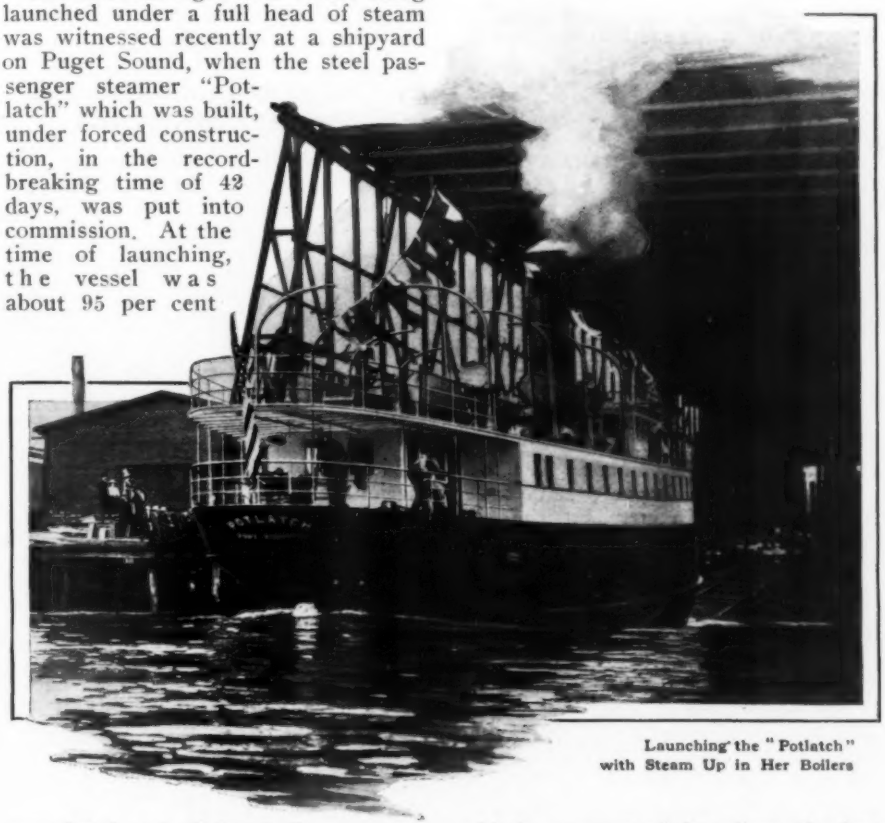
ELECTROCUTION FOR DISEASED ANIMALS

An apparatus for humanely ending the lives of diseased and unclaimed animals by electricity is being used in Boston. The device, which consists of one cage for dogs and four cages for cats, is operated by one man. The bottom of each dog cage contains a metal plate upon which the dog stands, and a metal collar is placed around the animal's neck. When the door of the cage is closed the animal is instantly killed by a current passing through its body. In the bottom of each cat cage are two separate plates, instead of one, and no collar is used. The fore paws of the animal are placed on one plate and on the other the hind paws, thus forming a complete circuit when the door is closed. About half a minute is allowed for electrocuting the average dog, and one minute for the average cat. The bodies, which are not mutilated in any manner by the operation, are disposed of in a gas-fired crematory at the average rate of 600 animals each week.

¶A new type of sawdust and mill-refuse burner, in which the expensive lining of fire brick is done away with, is being erected at one of the large sawmills at Vancouver. The burner consists of two steel jackets, one inside the other, with the intervening 2-ft. space filled with water. The double jacket extends to a height of 72 ft., and is 40 ft. in diameter. A single jacket rises to an additional height of 80 feet.

VESSEL LAUNCHED WITH STEAM UP

The unusual sight of a vessel being launched under a full head of steam was witnessed recently at a shipyard on Puget Sound, when the steel passenger steamer "Potlatch" which was built, under forced construction, in the record-breaking time of 42 days, was put into commission. At the time of launching, the vessel was about 95 per cent completed and all her boilers were in position. When the "Potlatch" was sliding down the ways, steam was up in her boilers, as shown in the accompanying illustration, and her own whistle announced her first dip into the waters of Puget Sound.



Launching the "Potlatch" with Steam Up in Her Boilers

THE GOVERNMENT'S RACK OF PRECIOUS MUGS

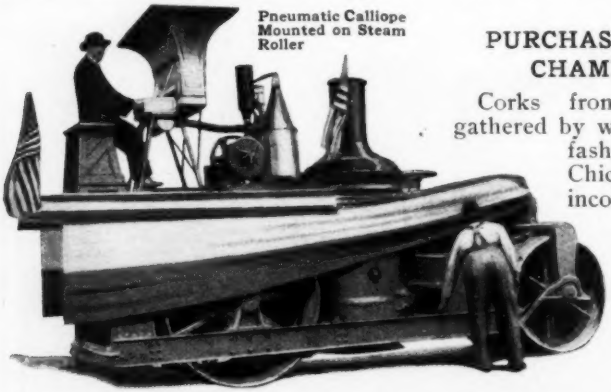
In the Federal Government's assay office in New York is maintained a rack of mugs which reminds one in some respects of such a rack in a barber shop, yet these particular mugs, being soaked with gold, are very precious indeed, even though they are decorated with initials and numerals much more crude than the initials on shaving mugs.

The mugs in question, which are the property of gold-mining corporations in North and South America, are clay crucibles for melting down gold. The reason for keeping individual mugs is that the clay takes up a considerable quantity of gold in the process of smelting, and that by having a separate cup for each customer, this loss always falls on the owner of the gold.

After two or three operations the clay is fully saturated and takes up no more gold.

CALLIOPE MOUNTED ON STEAM ROLLER

During a recent celebration in Wichita, Kan., a steam road roller was combined with a pneumatic calliope to make a "noise" instrument. The road roller was driven in the parade under its own steam, of course, but the only service it did for the calliope was that of carriage, as the rotary air pump of the calliope was driven by a 4-hp. gasoline engine. The calliope has 30 whistles, and a keyboard that any pianist can operate.



Pneumatic Calliope Mounted on Steam Roller

This type of calliope has been used in Wichita for political meetings, open-air advertising of all kinds, and even to provide music for dancing.

FIRE PHOTOGRAPHED BY ITS OWN LIGHT

This reproduction of a photograph of a fire is rather interesting in that the picture was taken just as the flames were eating their way through the cracks in the wooden structure, which was of the clapboard type. The numerous little flames along the clapboards give the appearance of rows of silver scales or spangles.

Burning House Photographed by Its Own Light, with Almost Every Clapboard Distinct

PURCHASE LIBRARY WITH CHAMPAGNE CORKS

Corks from champagne bottles, gathered by waiters in the hotels and fashionable restaurants of Chicago, provide a source of income by means of which the waiters' association of that city is equipping its club rooms with an adequate library. All the members of the association are instructed to save the corks, which are sold at $3.50 per thousand. The association now has a library of 2,000 volumes, the majority of which were purchased with the proceeds from such sales.

HOW FAR LIGHT BEAMS CAN BE THROWN

According to tests made under favorable atmospheric conditions the estimated distance that a lens will throw a 40-cp. beam of medium red light is 3.06 miles; medium yellow, 3.93 miles; lunar white, 3.09 miles, and medium green, 3.05 miles. These are the only colors that can be thrown a distance of three miles, while the range of blue is about one mile, and that of purple approximately one-half mile. A thorough knowledge of these various ranges is necessary in constructing signal lights for railroads.

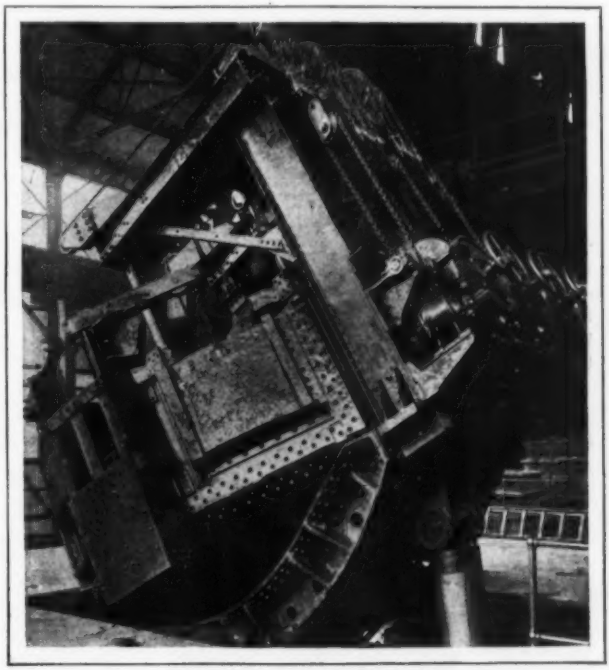
¶The first motorcycle escort ever provided for an incoming President is scheduled to have a place in the inaugural parade on March 4. Some 30 Georgians, members of the Savannah Motorcycle Club, will ride down Pennsylvania avenue behind the President-elect.

ELECTRIC FURNACE FOR PRODUCING HIGH-GRADE STEEL

Of all the many interesting processes to be witnessed in the making of steel, perhaps none is more so than that of the electric furnace; the operation of which, especially at night, affords a thrilling spectacle. Flames from the burning gases liberated from the molten metal play about the furnace, spitefully thrusting out long tongues of fire as if to warn the visitor against too near an approach; but when the electric flames have completed their work, and, freed from all impurities, the super-refined steel escapes from its prison, a wonderful exhibition of colored lights is produced, which neither pen can picture nor brush reproduce. The wildest dream of Arabian Nights fades before this master color creation of the 20th century, and the attempt of the artist, as brought to our readers on the front cover this month, is but a suggestion of the glories of light which celebrate the final separation of the impurities present in good steel, but which have been eliminated in what deserves the name of practically perfect steel.

There are several of these electric steel furnaces in this country, but the one which heads the rest is at the South Chicago works of the Illinois Steel Company. The electric-furnace section, however, is seldom open to visitors. While the electric furnace will rapidly reduce to a liquid masses of cold iron, it is really a refinery, a sort of post-graduate course, in steel making, hence, in practice, liquid steel is brought to it in ladles after the ore has graduated from the blast furnace to the Bessemer converter, and thence to the electric furnace.

In the Bessemer process not more than 10 or 12 minutes were spent, but in this final treatment from 1½ to 2 hours are required, in removing to the limit the sulphur and phosphorus which are always present to some extent in ordinary process steel.

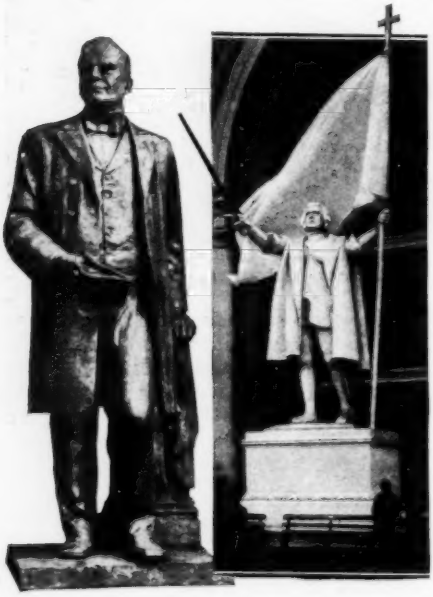


Electric Furnace Inclined for Pouring

What the visitor sees is an enormous iron box, 13½ ft. across, made of steel plates 1 in. thick on the outside and lined with magnesite brick. It is a sort of rocking chair, only the rockers and the floor it rests on have big teeth to prevent it from slipping when the box tips to discharge its contents. Instead of using coal or gas, which

themselves are full of impurities, as in other furnaces, the chemically pure heat of enormous electric arcs are used to burn out the impurities, and these electric flames, blinding in their terrible brilliancy, are brought into the furnace by means of three giant electrodes. Compare the size of the electrode, about the size of a lead pencil, used in the ordinary electric street lamp with the three electrodes of the furnace, each 5 ft. long and 2 ft. thick, and one has some faint idea of the intensity of the heat. These electrodes are fastened to copper holders, through which cold water is constantly passed to keep them from burning up, and to the holders are attached chains. The electrodes are so heavy an engine is required to hoist and lower them, controlled by an automatic device which keeps the electrodes always at just the right position. The electrodes enter through three openings in the top of the box, and other doors on each side permit the introduction of those materials which are used for their chemical effect. From time to time the furnace is tipped on one side and the slag which has risen to the top is run off. Tests are finally taken to show the condition of the steel. A small cylindrical test piece is poured and forged to a round pancake-shaped object under a steam hammer. If this sample shows a satisfactory condition of the metal, the treatment is pronounced finished, and the purified steel is drawn off and is ready to find its ultimate form and use; if not, it has to be still further refined.

The electric furnace at South Chicago has operated on a greater variety of products than any furnace in the world, and with a bewildering intermingling of high-grade alloy steels, high-grade carbon steels and ordinary carbon steel. It is a thrilling moment when, the process finished, the big ladle is swung in position in front of the furnace, and the great iron fire box begins to pour out its molten contents. Blinded by the terrific light, the visitor turns reluctantly away, and tries to imagine the thousand and one useful arts which these tons of perfect steel make possible and are destined to serve



"COLUMBUS" GOES INTO McKINLEY STATUE

The recent death of the sculptor who made the Christopher Columbus statue for the World's Fair has drawn attention to the fact that the Columbus statue went into the making of the William McKinley statue for McKinley Park, in Chicago. The Columbus statue, never considered a fine piece of work, was shunted around from place to place, the place sometimes being a dusty storeroom, until the South Park commissioners decided to use the bronze for the McKinley memorial.

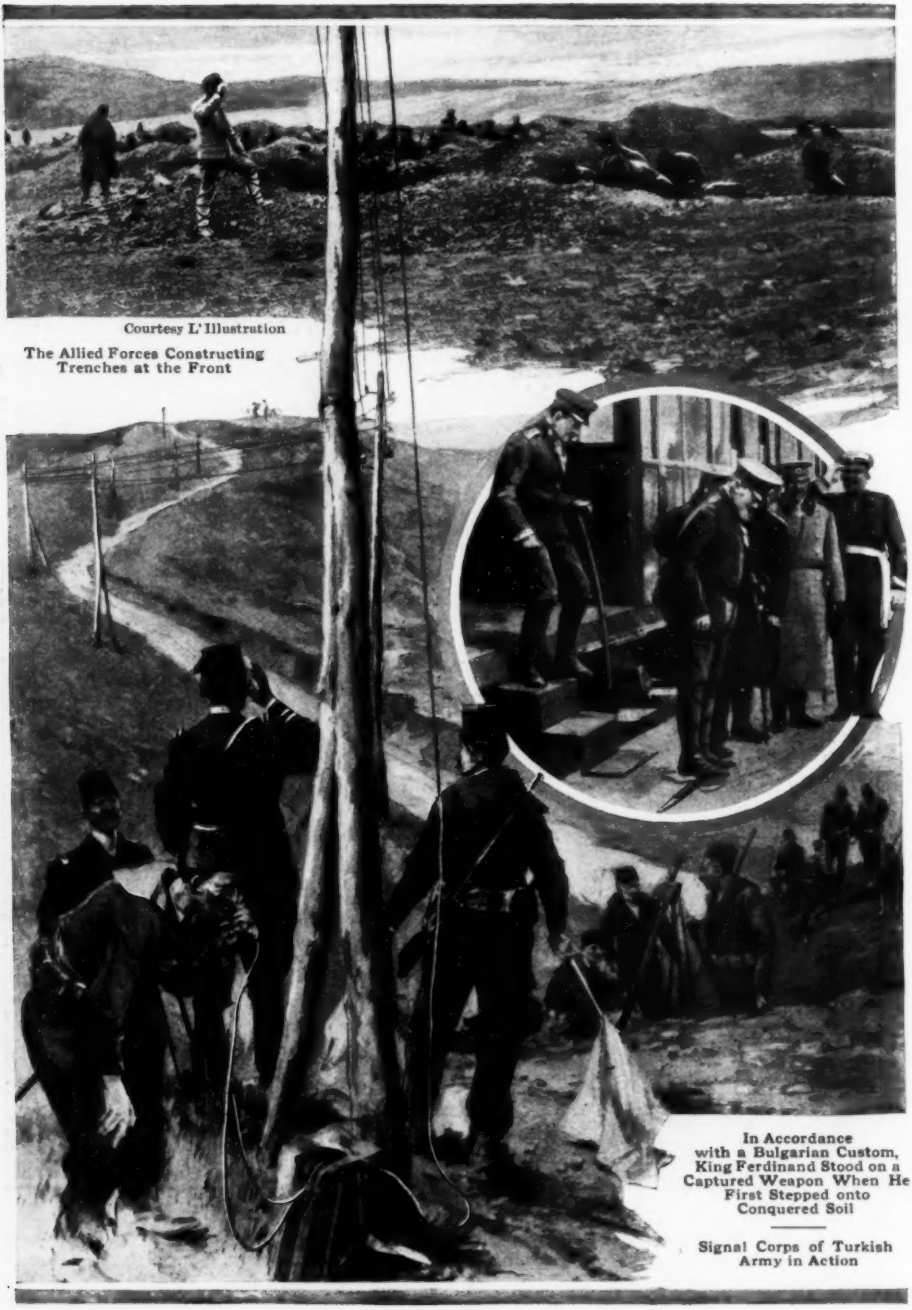
¶It is estimated that an investment of 860 million dollars would be required to produce mechanically as much nitrogen as comes yearly from the nitrate deposits of Peru.

TURKISH REFUGEES CHOKED STREETS IN SEAPORTS

Courtesy The Sphere

During the period in which the Turkish troops were being forced back upon Constantinople the streets of the seaports were choked with gaunt oxen and half-starved peasantry. The movement was so general as to seem like the migration of a whole people, the return of the Turk to Asia. The accompanying illustration shows the scene in Silivri. Bare-footed women in bright-colored baggy trousers drove their flocks along the road and little children goaded on the oxen.

FORCING THE TURK OUT OF EUROPE: SCENES OF



Courtesy L'Illustration

The Allied Forces Constructing Trenches at the Front

In Accordance with a Bulgarian Custom, King Ferdinand Stood on a Captured Weapon When He First Stepped onto Conquered Soil

Signal Corps of Turkish Army in Action

INTEREST AT THE FRONT IN THE BALKAN WAR

These Trenches Face the Strong Natural Defenses of the Turks

In Certain Bulgarian Regiments a Dog is Employed to Draw a Little Carriage on Which the Big Drum Rests

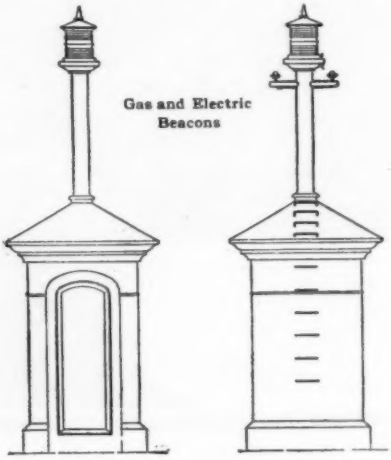
Bulgarian Troops Intrenched before Adrianople

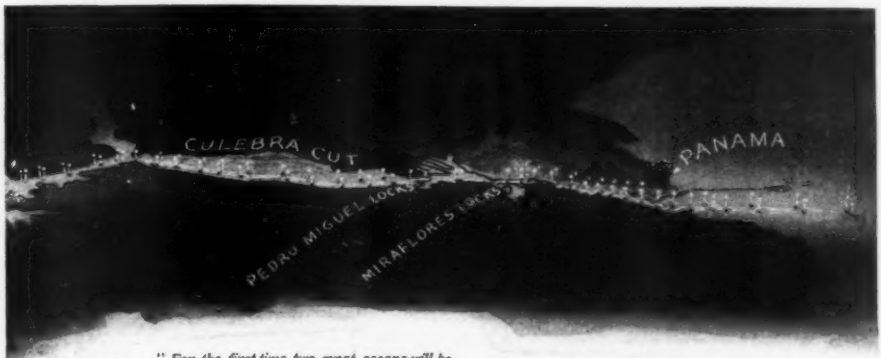
LIGHTING THE PANAMA CANAL

As the completion of the canal draws near, interest in the vast construction work merges into a great variety of details which will be necessary to its operation. For the first time two great oceans will be connected by an unbroken avenue of brilliant lights, through which the world's commerce will pass, for this canal will be in service every hour during every day in the year. Like stately sentinels standing at attention, a double line of buoys, beacons and lighthouses will enable the pilots to safely follow the zigzag course from Atlantic to Pacific.

In the lighting scheme both gas and electricity will be used; the gas lights will burn continuously, which is found to cost much less than attendance to light and extinguish, and, moreover, guards against hours of untimely darkness and fog.

The beacons are of two sizes, 15 and 30 ft., respectively, and are built of concrete. The lighthouses are 74 ft. high to the light, and are of the usual exterior form, being ascended by means of a steel spiral stairway with





"For the first time two great oceans will be connected by an unbroken avenue of brilliant lights, through which the world's commerce will pass, for this canal will be in service every hour during every day in the year."

an outside observation platform extending all the way around the lantern.

The lights are placed in pairs, directly opposite each other, and the navigator has only to keep in the middle of the "road" to proceed with safety and dispatch.

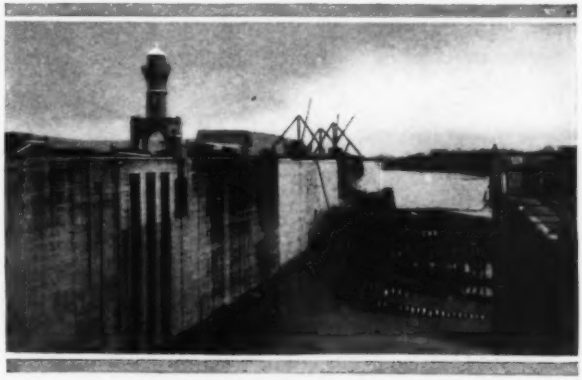
HIGH-PRESSURE GAS-LIGHTING TESTS

The illumination provided by high-pressure gas lighting is approximately equal to that furnished by flaming arc lights, but the annual cost of operating the latter is less than that of high-pressure gas lights, according to tests recently made in Manchester, England. It is also claimed that, had the gas lamps been working at double their actual efficiency, the electric lamps would still have proven the more economical to operate. The gas lamps, which were of the three-burner type, consumed about 80 ft. of gas per hour at a pressure of 60 in. of water. Inverted mantles were used throughout the tests.

¶Chicago is contemplating the installation of a high-pressure water system for fire purposes at a cost of $6,000,000.

ACETYLENE RAILWAY SIGNAL

An acetylene signal lamp that throws a flash light instead of a steady beam is being tested upon the lines of a Swiss railway. The advantage claimed for the flash light is that it could be used on automatic signals while using a steady light on mechanical signals, thus informing the engineer whether he were nearing a signal that could be passed with safety, or one that required an absolute stop. As it is very important that these two forms of signals give a different indication at night, as well as during the day, it is possible that the flash-light feature will be extensively adopted in the future.



Lighthouse at Entrance of Lock

SKYSCRAPER WHICH WAS NOT FIREPROOF

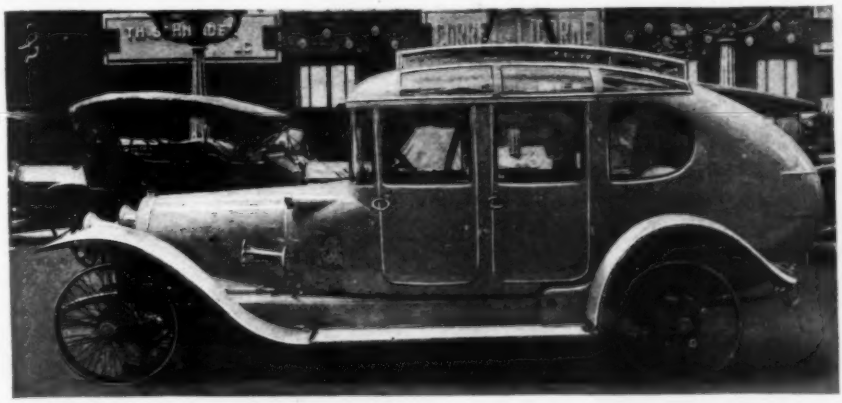
Cincinnati's recent $800,000 fire which destroyed half a dozen buildings in the very heart of the business district and threatened to wipe out an entire square, proved that the Union Trust Company skyscraper, said to be fireproof, was far from being so.

The big structure took fire from the burning Gibson Hotel adjoining. It was not long until the tall building was afire from the sixth to the 17th story with the firemen making frantic efforts to play their streams of water upon floors above the ninth story. They were unsuccessful, however, and the flames burned themselves out in the top part of the structure. Wooden window frames and interior finish and furniture proved to be all that was necessary to convert it into a mass of flames. The building was practically deserted at the time of the fire, and there was no loss of life.

TESTING HARDNESS OF RAILS BY BALL PRESSURE

An apparatus for testing the hardness of steel rails by ball pressure is being adopted by European railways. The device consists of a tubular body containing an upright piston or threaded circular shaft, to one end of which is attached a spindle for turning it in the same manner as pressure was applied in the old type of hand-operated printing press. When pressure is applied, the shaft gradually forces a steel ball into the surface of the rail, the pressure being indicated by a register attached to the machine. The apparatus withstands a pressure of 132,000 lb. and weighs 250 lb.

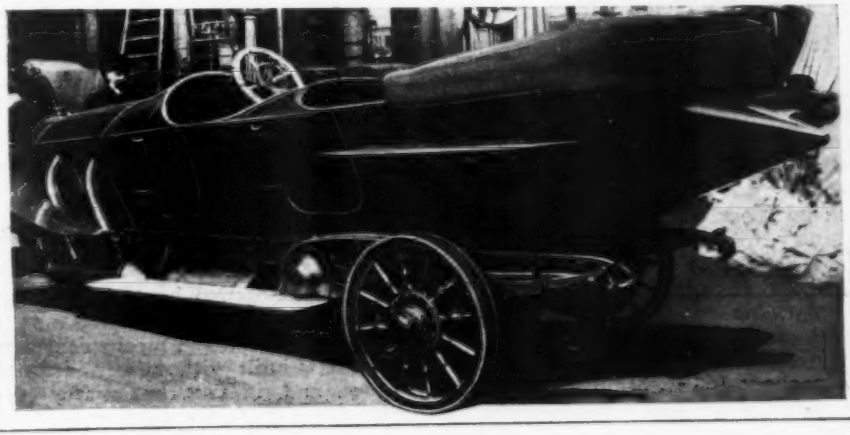
Cincinnati Skyscraper Claimed to be Fireproof, Gutted by Fire Which Started in Adjoining Hotel

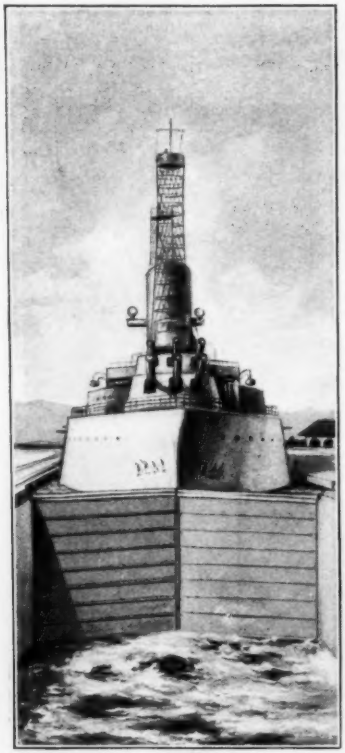


Upper View—A Rather Startling Egg-Shaped Body; Center View—A New Location for the Rear Light; Lower View—A Double-Torpedo, 90-Hp. Mercedes

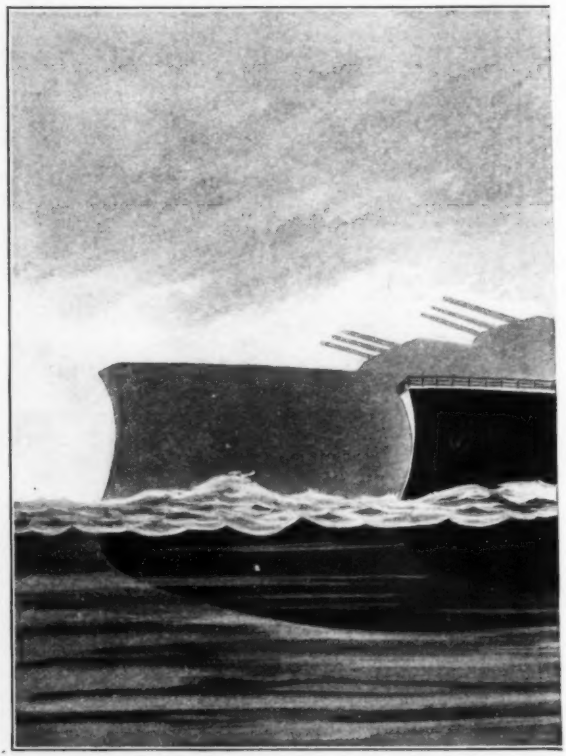
NOVELTIES AT THE FRENCH AUTOMOBILE SHOW

Two somewhat opposing types of automobile bodies, and a new location for the rear lamp, all of which were features of the automobile exhibition in Paris, are here shown. The egg-shaped body reminds one that "Humpty Dumpty sat on a wall." In contrast to this is the double-torpedo, 90-hp. Mercedes, which has a stern tapering to a sharp point reminding of a spur. The other illustration shows a rear light mounted under a mudguard having a V-shape.





The Close Fit to the Panama Locks Which will Fix the Size of Battleships 10 Years from Now



Battleship of 10 Years Hence Compared with the "Pennsylvania," 28 Ft. 6 In. Draft, and 31,000 Tons Displacement. 106 Ft. Beam, 36 Ft. Draft

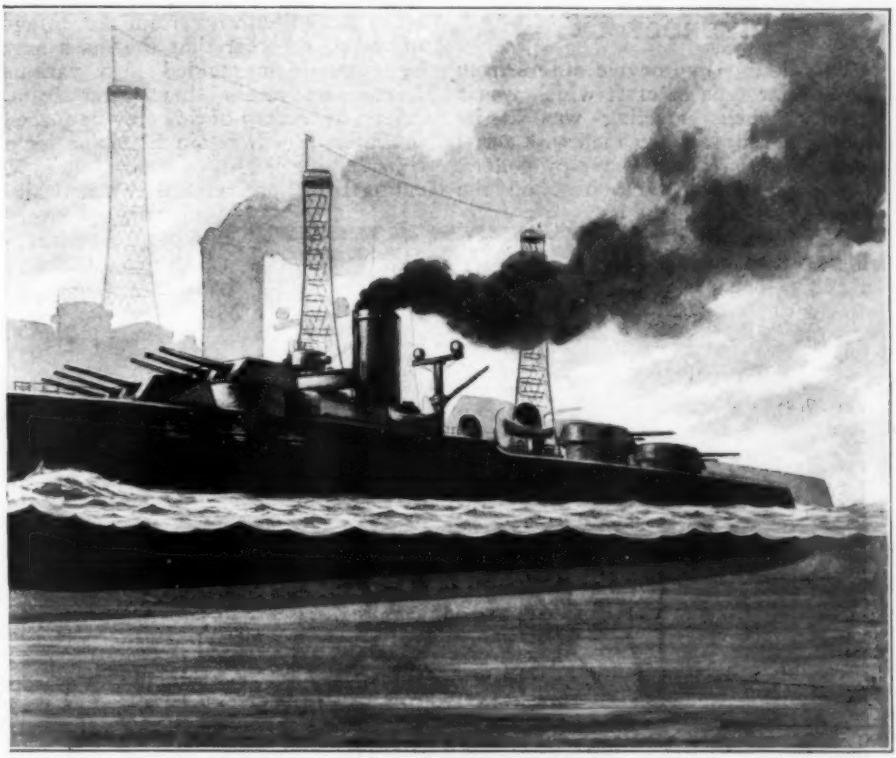
BATTLESHIPS TOO BIG TO ENTER PORTS

It is predicted by Richard H. Robinson, the naval constructor who is designing the new battleship "Pennsylvania," that the battleships built 10 years from now will have such a draft and such a length as to prohibit their entering any American port save that of New York, and but few of any other country.

"Warships 10 years hence," he says, "will be so large that they will be barely able to squeeze through the locks of the Panama Canal. That is, they will be little less than 1,000 ft. long, about 106 ft. beam, have a draft of about 36 ft., and a displacement of approximately 55,000 tons. New York Harbor is the only harbor in the United States that would admit a ship of these great dimensions. There is not a drydock, not a coaling station, nor a yard to care for a ship of this size. It means that harbors not only will have to be deepened and further dredged, but that naval stations will have to be increased in size."

VALVELESS PUMP CREATES HIGHEST VACUUM

A vacuum pump has recently been perfected which has three claims to being a scientific and mechanical wonder. It is built without any piston or valves, and, in fact, has a free open inlet and a free open exhaust passage; it has proven its ability to make a far



the Plans for Which Have Recently been Completed—The "Pennsylvania" will be 600 Ft. Long, 97 Ft. Beam, The Battleship of 10 Years Hence is Expected to be 1,000 Ft. Long, and 55,000 Tons Displacement

more complete vacuum than any device ever before constructed, and its principle is one of abstract ideas which one would ordinarily not associate with a mechanical device.

In its simplest form it is only one cylinder revolving within another cylinder. The outer cylinder has one opening as an inlet and one as an outlet, and there is a slot on the inside of this cylinder, running from the inlet entrance to the outlet. In operation, the inner cylinder is revolved at high speed, and sucks air in through the inlet, forces it along the little slot, and out through the exhaust passage.

The principle upon which it operates is that molecules of the air normally move among themselves at a certain enormous speed, and that if they could be forced along at a higher speed in the cylinder, they would all be thrown out. As a matter of fact this high speed cannot be attained in one cylinder, but by using three cylinders, connected up in series, the high speed is attained. In this pump the inner cylinders revolve at rates of from 6,000 to 12,000 revolutions a minute.

The best ordinary type of vacuum pump will draw air out to within 1/76,000,000 of its original contents, but this pump has succeeded in drawing it out to within 1/3,800,000,000 of the original amount. The possible applications of this pump to commercial uses are many, one being the making of the vacuum in the ordinary incandescent-lamp bulbs.

AERIALLY PROPELLED HYDROCYCLE

This double hydrocycle differs from the similar type of craft which was a novelty when bicycling was at its height, in that it is provided with aerial propellers instead of water propellers. The propellers are mounted on the frame just back of the saddles of the riders. The curious craft has been tried out with success at Milan, Italy, attaining considerable speed.

Double Hydrocycle Equipped with Two Aerial Propellers

THE SAND-CLAY ROADS OF NORTH CAROLINA

In bettering the public highways of North Carolina it has been found that roads made of sand and clay are cheaper to build and maintain than those constructed from other material. Experience indicates that the best sand or gravel to use for this purpose is a clean, sharp grit, the grains of which are coarser than those used in making mortar. The most desirable kind of clay is that which becomes sticky, or doughlike, when mixed with a certain percentage of water, in order that the mass may be pressed or molded into various forms and retain them after being dried. If a lump of this clay be placed in water, it will retain its shape for a considerable length of time, thus indicating that this material is practically nonporous—a very important consideration in building sand-clay roads. An excellent test of the proper clay for roads of this kind is to wet the finger and put it against the clay. If any of the clay adheres to the finger, it is of the right quality; otherwise it is safe to assume that the material would not be desirable. The proportion of sand and clay should be such that there is just enough clay to fill the spaces between the grains of sand, as the clay is the binder that cements these grains together. It is estimated that a good sand-clay road contains about 80 per cent of sand and 20 per cent of clay.

COMMENT AND REVIEW

THE energy, effort and expense incurred by the daily press in its desire to secure for its readers the earliest obtainable information of important events has long been a source of credit to enterprising publishers and of wonder to their readers. For a cent or two one may obtain news to secure which reporters have jeopardized their lives and thousands of dollars have been spent. Quite as interesting, though less thrilling, would be the stories the public never hears, of equally great efforts which resulted in failure.

Film-Making Enterprise

The glory of original and daring initiative in these matters no longer is monopolized by the dailies, for the makers of films for moving pictures are exhibiting the same resourceful spirit. Whether in their anxiety to give the public what it wants they are tempted to encroach on subjects which in the past have been considered too sacred for ordinary exhibition is a disputed question even among the clergy. However, we will content ourselves with a recital of what has just been accomplished.

One hundred thousand dollars was spent in making a film entitled "From the Manger to the Cross." In order to procure this a company of forty-two players were selected, trained and taken to Palestine and Egypt, with all the necessary movable scenery and effects. Skilled workmen were taken along to erect such scenes as the stable and manger in Bethlehem. The curiosity of the natives who continually swarmed about the actors and operators made the work difficult, but after four months of constant work in which scene after scene was rehearsed dozens of times, the picture story was finally completed.

WE were talking about conservation when the editor of the Grain Dealers' Journal said to me, "It's a wonder some of your inventor readers don't find a useful means of utilizing the corncobs." I had to confess to an impression that corncobs couldn't amount to much, which is probably the opinion of the average reader: But see how the corncob actually piles up. Our corn crop in 1912 was 3,160,000,000 bushels, with an average of 14 pounds of cobs to each bushel, or more than 22 million tons of cobs. This vast amount of product taken from the soil in a single year and practically none of it returned. A few cobs, it is true, are made into smoking pipes, and a few are ground up to mix with certain types of cattle food, which would otherwise be too solid for easy digestion, but the cobs from one township would supply this demand many times. It seems the cobs cannot be used for fertilizer unless they are split lengthwise, for if used unsplit they last indefinitely and fertilize about as much as so many pieces of hickory wood of the same size.

The Corncob Problem

In thousands of shipping stations throughout the entire corn belt, the elevator men are now burning these 22 million tons of cobs in order to get them out of the way, and to do this are obliged to erect special burners similar to those used in sawmills to dispose of the waste trimmings. Before the days of gas cooking ranges the kindling industry was a thriving one, but even for starting fires cobs could not be shipped, as the bulk per ton makes the freight rates prohibitive.

Ten tons is about the minimum carload rate, but ten tons of cobs would make a pile as big as a house. The solution, therefore, must evidently be one which can be applied on the farm where they grow, which means each farmer would shell his own corn. This is no longer a difficulty, as gas engines are now part of the equipment of every up-to-date farmer. The scheme would also have the advantage of increasing the amount of actual corn hauled in any given load, to the extent of 14 pounds per bushel, for it is the kernel and not the cob for which the elevator man pays, and which is sold in the grain markets of the world.

What seems to be wanted is, first, some practical use for the cobs on the farm where they grow, and then a simple, inexpensive process or machine for converting the cob into a condition suitable for that purpose. It is an easy guess that were corn grown in Europe — which it is not — they would long ago have discovered a better method of disposing of 22 million tons of vegetable matter than merely burning it up to get it out of the way. The idea is not unworthy the generous endowment of a "foundation" by somebody.

IT seems quite safe to predict that the Atlantic Ocean will not be crossed this year by an airship of any description. The one unsuccessful and the one tragic attempt which have been made, establish a degree of peril and insufficiency of construction which certainly will prevent another effort in the present state of the art. That the feat will never be accomplished is unlikely, though science and mechanics must serve apprenticeship for some time yet. Grahame-White holds out hopes that he will be able to make the crossing in 1915, but frankly admits the crossing is not to be considered with apparatus and engines of present development. In his opinion what is required is four engines of 250 horsepower each, which should enable the crossing to be made in 30 hours — an average speed of 100 miles per hour. He hopes to visit the Panama Exposition at San Francisco, flying all the way from London, and traveling via New York and Panama. Inasmuch as Grahame-White is numbered among the most progressive in execution, and is one of the conservatives in promises, his prediction is full of encouragement.

Trans-Atlantic Flight

In this connection it is not inappropriate to refer to the perplexity which for several weeks has prevailed in England regarding a mysterious air craft which was reported hovering over several towns on

the night of October 14. The military department denies all responsibility for the weird visitor, whose presence seems to be thoroughly established. The anxiety in army circles as to whence it came has extended to Parliament. It has been determined that France can be counted out, leaving the only other alternative a German airship. One of the Zeppelin-type dirigibles is known to have been in the air on a long voyage on that date, and it is even admitted that she was in the air for 31 hours, during part of which time she traveled from Hamburg to Gotha at a speed of 43 1-2 miles per hour, though experts declare the ship can easily travel 50 miles per hour. As the distance from the supposed starting point to Sheerness, England, one of the reporting stations, and back to Berlin is 1,348 miles, it is conceivable that one of the big German airships actually made the voyage which might easily have been accomplished in 30 hours. In view of the fact that neither England nor France has an air craft of any description capable of a similar performance, there is "quite a bit of uneasiness, you know."

COMMENTING on the annual motor display at which cars valued at more than a million dollars were exhibited, The Car, a leading London weekly, takes occasion to refute the impression prevailing in some quarters that the motor car is an evidence of an undue increase in wealth. And the editor makes an analysis to show that instead of denoting growing extravagance, the motor car, in his country at least, makes for economy. "Motoring is not a luxury any longer, but a means of living one's everyday life to more advantage for business and recreation alike." The same class of people who are now using high-grade cars had, in 1902, ten years ago, the following vehicle equipment: A family omnibus, a brougham, a wagonette, two dogcarts, and one pony cart besides the horses. To care for these they employed a head coachman, a first groom, a second groom and a helper. Against this equipment and help they have now one motor-car limousine, and one two-seater (perhaps), while the help consists of one motorman, and a cleaner once or twice a week.

The Age of Wanderlust

A positive saving in expense has thus been accomplished. The reason the condition now is more spectacular is because in the horse days there was nothing to correspond to the present-day motor show. And, to quote the same authority again, "'How rich these people must be,' is, therefore, a thoughtless cry. And, above all, we live in the age of the Wanderlust. Everyone, from prince to pauper, has become restless and travels infinitely more than 50 years ago, partly because traveling is so much more comfortable and cheaper, and partly because everyone is doing it. Just as a former generation spent money on horses, and a previous one on dress, and a previous one again on armor and fortified castles, so this generation spends its money—that which it can afford, and much it cannot afford—in motor

cars, railway and steamship traveling, and in trying to get away from the smoke-grimed city."

The growth of the motor car, therefore, is not necessarily a sign of huge and growing wealth, but of a world-wide desire to move about more.

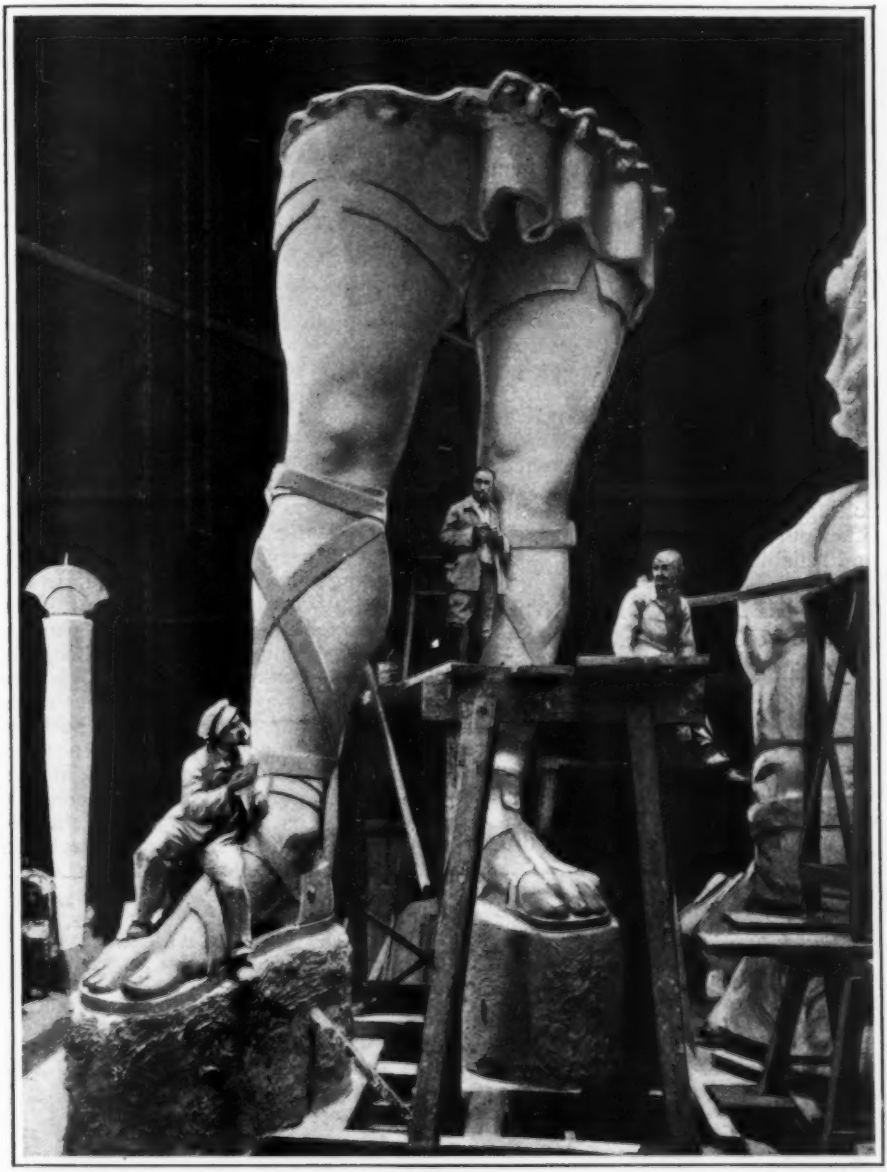
ON another page, in "The Wonders of Light," is related the story of the time and distance occupied by the travel of a star beam. Reference is made to the fact that the light waves emanating from this planet on the day Columbus landed on these shores, are just reaching their destination on some distant star; and at this moment may be seen for the first time by the inhabitants of that far-away body, if inhabited it be. On other solar bodies beams which took their outward impulse the day the Sphinx was finished, are this instant finishing their journey. The history of countless worlds through unknown ages are thus darting through space toward some final resting place, determined thousands of years ago. Overwhelming as is the contemplation of these stupendous thoughts, it is impossible to restrain a daring hope that the scientists and inventors of the future may be able to seize these star beams and by means of some marvelous transforming apparatus, convert the points of light into magnified details, and throw upon a screen or photographic negative the picture of events which were occurring hundreds and thousands of years ago. Try to imagine, if you can, the unspeakable fascination of such a moving picture of worlds long since extinct and the last tragic days of their strange and helpless inhabitants.

A Dream of Light

The dream seems a wild one in the last degree; our imagination cannot stretch to take in the fullness of its possibilities; and yet there was no telephone when Chicago burned, nor any electric lights when Hayes was president.

H. H. WINDSOR

MASSIVE LEGS OF STATUE OF NORWEGIAN HERO

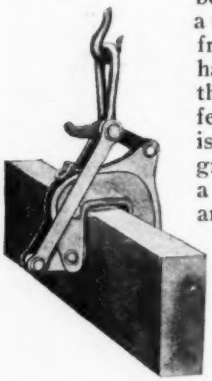


Courtesy The Sketch

The German emperor is to give to Norway a gigantic statue of Frithjof, the great Norwegian hero who is glorified in a famous Icelandic saga. The statue, an idea of the gigantic size of which can be gained by comparing this portion of it with the figures of the three men, is to be placed, sometime this year, on a peninsula in the Sogne Fjord.

STEEL HAND THAT LIFTS FIFTY TONS

A powerful lifting clamp for both raising and conveying steel plates, beams and other articles weighing from ½ to 50 tons has been placed on the market. The feature of this clamp is the clutch which grips the material in a positive manner and which is said to have greater holding power than similar devices of older types. The clamp was designed for use in steel works, rolling mills, foundries, and for all other purposes which require a positive and reliable lifting device.



LONG REINFORCED-CONCRETE VIADUCT IN CINCINNATI

A reinforced-concrete viaduct, 1,200 ft. long, has been built in Cincinnati at a cost of $250,000 to shorten the distance between the city proper and a number of its hilltop suburbs. It will shorten the routes of several car lines by more than a mile.

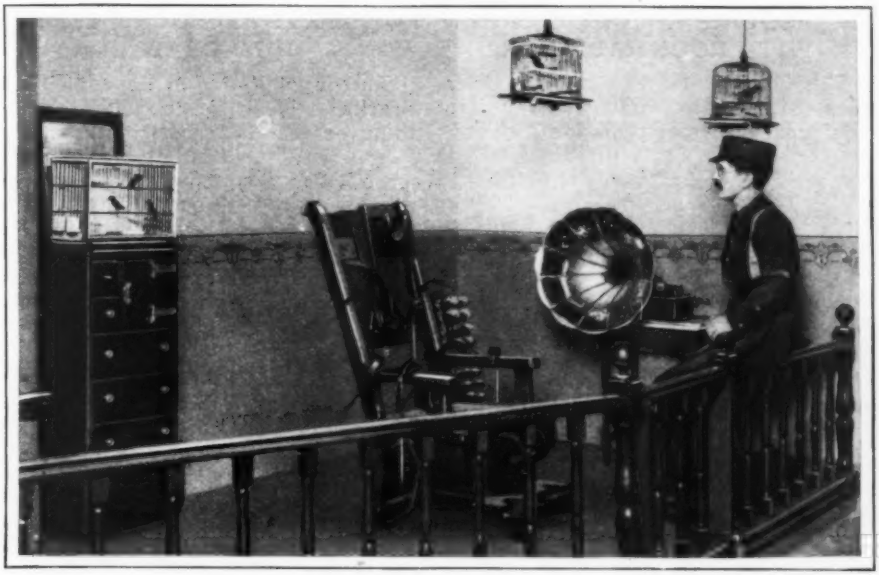
Owing to the great length of the viaduct, it was constructed in sections of 200 ft. each, which makes it really a series of independent structures. A new form of expansion and contraction joint was used for connecting the sections, two angle irons being bolted down to the concrete roadway, back to back and 19 in. apart, filled with a special asphalt. A heavy bent copper plate is placed under the angles and down into the opening to retain this asphalt. The joint in the sidewalks consists of one plate sliding on top of a second and covering the opening.

TRAINING CANARIES IN A DEATH CHAMBER

Training canary birds to sing in the electric death chamber of the Ohio penitentiary at Columbus, is the unique life work of John Atkinson, a murderer serving a life sentence who, being a "trusty," has the privilege of spending some of his time there. In the room in which more than four score condemned men have paid the penalty for their crimes, he breeds the little yellow singers. When the birds are at the proper age, he first teaches them to fly—first from one arm of the electric chair to another, and then from the death chair to the old gallows above, in another part of the room.

As soon as the birds can fly, he begins giving them singing lessons with

The 1,200-Ft. Reinforced-Concrete Cincinnati Viaduct, Constructed in 200-Ft. Sections Connected by Special Expansion Joints



Beside the Electric Chair in the Ohio Penitentiary a Life Prisoner Breeds Canary Birds and Teaches Them to Sing

the aid of a graphophone. Placing the musical instrument in front of the bird cages, he plays song after song, until the little birds are carried away with the music and sing themselves. Atkinson is careful about the class of music he teaches his birds to sing by. He does not play ragtime—most of it is slow, dreamy waltzes. The music lessons are continued until each bird is a good warbler. Then the convict sells the birds to fanciers in the large cities.

He does not forget the unfortunate condemned men who are awaiting death in an adjoining room—who are waiting to die in the very chair upon which he teaches his birds to fly. Through a peephole in the door connecting the two rooms, he frequently passes birds in to the condemned men, that they, too, may hear the joyful singing.

Atkinson was sent to the penitentiary many years ago to serve a short sentence for robbery. One day he attempted to escape and killed a guard who blocked his way to liberty, for which crime he is now imprisoned.

AIRMAN PHOTOGRAPHED FALLING TO DEATH

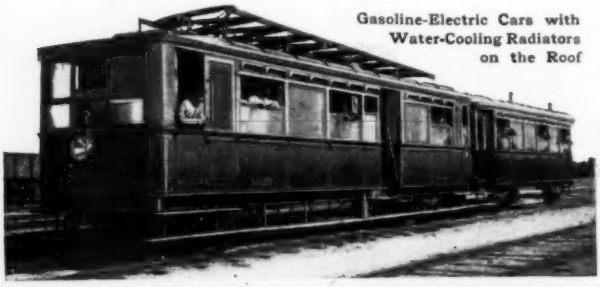
The fatal fall of the Swiss airman, Maurice Blanc, on the military field at Châlons, France, caused particular emotion in that country, because his machine, an "Antoinette," was one of the French pioneer makes. It was with this machine that Latham won fame. The "Antoinette" monoplane is no longer built.

Blanc, who was but 24 years old, was flying at a height of 1,000 ft. when one of the stay wires broke, causing one wing to become detached. Several photographs were caught of Blanc and the machine during the fall.

Courtesy L'Illustration

GASOLINE-ELECTRIC CAR WITH ROOF RADIATOR

The self-contained motive-power cars of a Hungarian railway are equipped with roof radiators for cooling the water necessary for keeping the gasoline engines from overheating. The gasoline engines drive dynamos, which generate the current for operating the motors of the cars.



Gasoline-Electric Cars with Water-Cooling Radiators on the Roof

AN UNUSUAL "SPITE-HOUSE" IDEA

Nailing old stovepipes, brooms, pans and other disfiguring junk of similar nature, on the sloping roof of an old house for the purpose, it is said, of spoiling the surroundings of a building across the street, is an example of "spite work" that may be seen in Bath, Maine. It is claimed that the owner of the old house disfigured it in this manner because the owner of the new building bought that property instead of his.

Old House Disfigured by Its Owner to Spite the Owner of a Building Facing It

OLDEST AMERICAN TREE IS DEAD

The great fir tree in Ravenna Park, Seattle, said to be the oldest living thing on the American continent, and which, it is estimated, antedates the Christian era, is now dead. For several years it has been known that this giant fir was infected with a growth which seemed to gradually sap its life, and last year only a few of the topmost branches showed green. Now forestry experts pronounce it lifeless, having found no sap in the bark linings.

The famous fir has a circumference, 18 in. above the ground, of 58 ft., and the bark is 18 in. thick. The age of the tree is estimated by comparison with a fir stump near by, which has a diameter of about 12 ft. The ring growths shown by this stump, of which there are from 11 to 16 to the inch, show that its age must be more than 1,000 years. The diameter of the fir tree in question is about 20 ft., with an estimated age of 2,000 years.

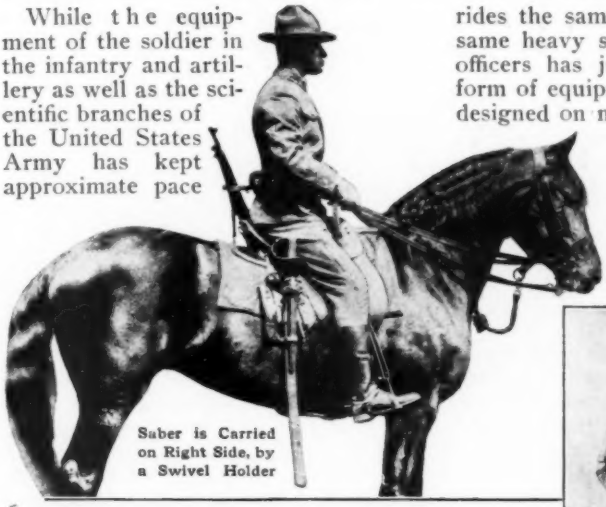
WIRELESS PRACTICE ON BRITISH SHIPS

Regular practice in wireless telegraphy communications between British warships and ships of the British mercantile marine is being established for the purpose of insuring reliable communications when required. The exercises, which are carried out when they will not interfere with commercial or naval work, take place daily from 8:30 to 9:15 a. m., and from 2:30 to 3:15 p. m.

¶Making bungs for barrels is an industry comparatively unknown. One factory in Ohio uses 10,000,000 ft. of poplar and oak lumber annually, producing 360,000,000 bungs a year.

CAVALRY EQUIPMENT IS BROUGHT UP TO DATE

While the equipment of the soldier in the infantry and artillery as well as the scientific branches of the United States Army has kept approximate pace with the development of military science, there has been practically no change in the equipment of the cavalryman since immediately after the Civil War—except that he has been given a new rifle and that his revolver is different. He rides the same saddle and carries the same heavy saber. A board of army officers has just agreed upon a new form of equipment for the cavalryman designed on modern lines, which is to be given a test in actual service for six months or a year and then finally adopted, if the service tests prove what the board believes they will.



Saber is Carried on Right Side, by a Swivel Holder

New Nose Bag

Adjustable Seat of Saddle with Hinges in the Cantle

When a Cavalryman is Mounted, the Butt of the Rifle Rests in a Pouch

The Rifle Carrier. The Rifle is Hung from the Belt by a Strap, and Held Upright by a Steel Ring on the Belt

The new saddle is a radical departure from the traditional army pattern. It has a base of sheet steel covered with leather, an adjustable seat, provided with hinges in the cantle and pommel, so that it can be adjusted to fit the man and the uses to which it

is put. It is smarter-looking than the old saddle and is provided with open steel stirrups instead of the hooded kind that have always been used. The bridle is a combination halter and bridle and will do away with the old watering bridle. It is provided with a bridoon, or snaffle, as well as a curb bit and can be transformed into a halter simply by the removal of the bit and the adjustment of a few straps.

The rifle carrier for the mounted man has always presented more or less difficulty because of the distribution of weight on the horse. The new carrier consists of a boot in which the butt of the rifle will rest, which is attached to the saddle, and a covered steel ring, attached to the rear of the soldier's belt, for the barrel of the gun. When the man is mounted the rifle is hung from the belt by a strap which is attached to the trigger guard, and is thus attached securely to the man so that, no matter how he leaves his mount, he will take the rifle with him. Ordinarily, when on foot, he will carry the rifle in his hands, but when he prepares to mount he will swing it behind him by the belt strap and when he gets into the saddle will simply push the butt down into the boot, which is provided with stiff steel springs that clamp it so tightly that it cannot free itself, and yet not so tight but that a jerk from the trooper will free it.

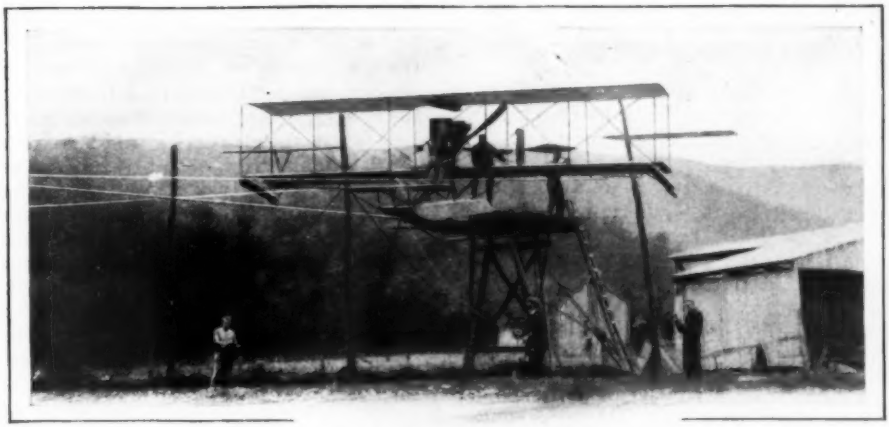
The new saber is a lighter weapon than the one now in use and is straighter. It has a steel guard, like an old-fashioned cutlass in some respects, and is provided with a wooden scabbard. It is attached to the right, or off-side, of the saddle by a swivel and hangs down just behind the trooper's right leg. The guard and scabbard will be finished in a dark color so as not to flash in the sunlight. It is the intention of the War Department to try a hair pad for the saddle instead of the old saddle blanket. The saddle pockets are placed on the pommel, and provision is made for carrying part of the equipment on the cantle as well, when necessary. The steel picket pin usually carried has been made into a serviceable tool which forms the handle for a spade or hatchet for use in intrenching, and has a heavy head that can be used to drive pegs for tents if necessary. The picket pin will be attached to the saber carrier. The old pole for the shelter tent has been done away with. The scabbard of the saber is so shaped that it can be used as a pole.

The great gain that has been made in the new equipment is not only in appearance, as it seems much less than the old, but the distribution of weight has been such that it is easier on the horse and much more comfortable for the man. The entire equipment for field service, including the personal equipment of the man, weighs a trifle over 112 lb. In the nose bag for the horse a distinct improvement has been made. This consists of a canvas cylinder open at one end. In use the front end is suspended just under the horse's mouth, while a strap going over its neck brings the rear end against the neck and higher than the front end. This permits the grain to fall by gravity into the end where it is convenient for the horse to take it and does away with the waste of grain in the old bags, occasioned by the horse attempting to swing the bag so as to obtain all the grain. In addition to this, the nostrils of the horse are kept outside the bag and this permits plenty of fresh air.

The red and white guidon or small troop-marker flag, so long a part of the cavalry equipment, will give place to a yellow guidon which will have the troop insignia in black letters.

MOTOR TRUCK BUILT AT SING SING

The convicts of Sing Sing prison have constructed a complete motor truck, which, the prison officials believe, is the first motor vehicle ever built within prison walls. Having built it, the prison authorities were determined to sell it, so it was offered to the street-cleaning department of New York for $5,000.



Successful Test of a Cableway Apparatus for Launching Hydro-Aeroplanes from Battleships

CABLE RUNWAY LAUNCHES HYDRO-AEROPLANE.

Among the several devices recently experimented with for launching hydro-aeroplanes from battleships is one devised by Glenn Curtiss. This comprises a tightly stretched cable upon which the hydro-aeroplane runs, guided by a groove in the bottom of the pontoon or boat, until it sails off into the air, with side wires stretched parallel to the cable for supporting the wing ends and preserving lateral balance until sufficient speed is acquired to give the ailerons a controlling force.

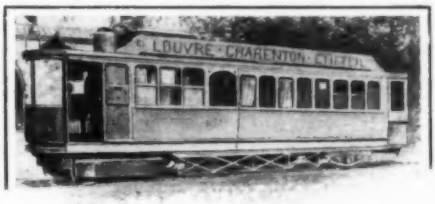
The apparatus was successfully tested out on the shore of Lake Keuka, New York.

GOAT RAISING PROFITABLE AS A BUSINESS

When the steadily growing demand for glazed kid and other goat-skin leathers and the rather limited supply of suitable raw material are considered, it would seem that the raising of goats as a business would prove exceptionally profitable. Goats are so hardy that they thrive on scanty vegetation, such, for instance, as is found in hilly or mountainous districts which are unfit for cultivation.

PARIS HAS STEAM STREET-RAILWAY SERVICE

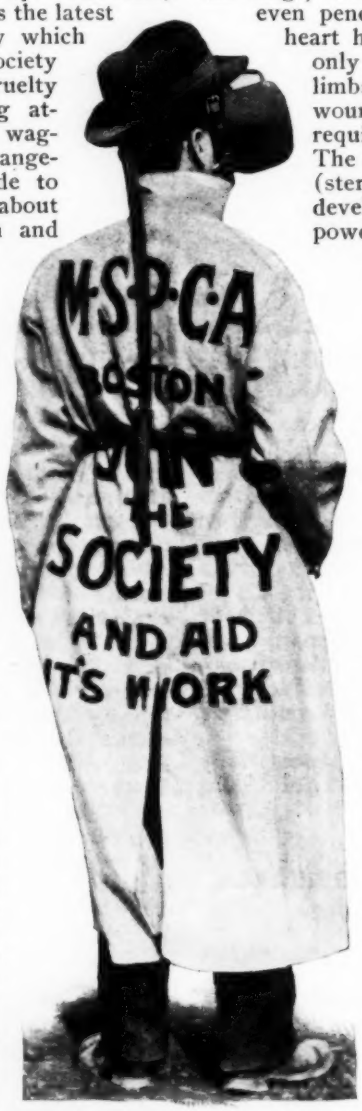
Steam street-railroad cars would seem to be relics of the past, but there are still several examples of them in Europe. While most of these are to be electrified in the near future, some experts maintain that they have certain advantages over the electric system, stating, for instance, that the steam car needs no central station and no means of taking or renewing power are necessary. There are several types of steam cars in service in Paris. In one type a special truck at the forward end carries the steam engine, the steam from which is condensed in a condenser that occupies the entire roof of the car. The body of the car is divided into three compartments, the front being the motor cab. Inside the car there is space for 35 passengers and 15 more can be carried on the platform. Double-decked types are also in use.



Steam Street Cars That are in Constant Service in Paris

MEN WEAR BLINDERS AS OBJECT LESSON

Men walking about the streets with their heads drawn back by check reins, and wearing blinders, is the latest "publicity" method by which the Massachusetts Society for the Prevention of Cruelty to Animals is drawing attention to the war it is waging for the horse. Arrangements have been made to have the men walk about the streets of Boston and other large cities in the state.



How Massachusetts Society Agitates for Humane Treatment of Horses

MODERN RIFLE WOUNDS IN THE BALKAN WAR

Wounding an enemy in war is better than killing him, for unless he is captured it imposes on his side the burden of taking care of him. The Balkan war has again proved that the bullet of the modern high-power rifle with its terrific speed will go straight through a man, penetrating the most vital organs, without killing him; and it has even been found to go through from four to six men, one behind the other. This puts them out of the fight, but at the same time it is a good thing for the fighter, for it gives him a far better chance for his life.

Professor Tedlicka, who is acting as Austrian Red Cross surgeon in Belgrade, reports his experience with 670 soldiers wounded in the war. He calls the modern small-caliber bullet a very humane instrument, the injuries from which are usually severe, but heal rapidly. Injuries of the lungs, liver, brain, abdomen, and even penetrating wounds of the heart heal promptly. He had only two amputations of limbs among this number of wounded, and only 20 limbs required plaster bandages. The modern bullet is aseptic (sterile), owing to the heat developed by the high-power powder. If long bones are struck they are shattered to pieces only if the bullet has lost much of its original momentum. Shots through the thigh bone, the upper arm bone and the skull have been observed, with healing of the wounds in two weeks. A large percentage of the injuries have been caused by the bayonet, proving the frequency of hand-to-hand combat in this war. Another interesting feature of the wounds among the Turkish captives is the fracture of the base of the nose. The injury is caused either by the recoil of the Mauser rifle or by the blowing into the face of the closing lever of the rifle magazine, an accident which the Turks are unable to provide against on account of unfamiliarity with the weapon. The first-aid packet, carried by the Servian soldiers, has again proved its usefulness, and to this packet is attributed the prompt healing of the wounds.

TYPEWRITING 593 WORDS A MINUTE

A record of writing 593 words a minute is claimed for a new typewriter, which writes syllables instead of letters, perfected recently by a Kentucky inventor. The group of keys at the left of the keyboard can, singly or in combination, print any of the consonant sounds which begin words. In the same way the middle group, operated by the thumbs, can be made to print any of the vowel sounds, and the group at the right, any of the final consonant sounds. By pressing "s" on the left, "a" in the middle and "t" on the right, at a single stroke of the hands, "s" is printed on the left of the paper tape, "a" in the middle and "t" on the right, making the word "sat."

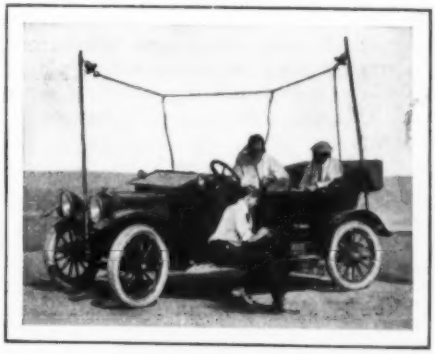
The record of 593 words a minute was made in writing a dictated letter which had been previously practiced on the machine by an operator who was blindfolded. He has also written 200 words of new matter per minute. The device is much simpler than a machine for the same purpose already described in this magazine.

Machine That Does Away with Stenographic Notes

AUTOMOBILE EQUIPPED WITH WIRELESS TELEPHONE

Exhaustive experiments with the wireless telephone, in which an automobile plays a prominent part, have been made recently by E. C. Hanson, of Los Angeles. One of the most interesting and successful of the experiments with the wireless-telephone car was the receiving of a message over the ranges from Long Beach to the car on Lookout Mountain, a distance of 35 miles.

Strapped to the front and back of the wireless-telephone automobile are sectional poles supporting aerial wires and high-voltage insulators, by which the waves from the sending station are picked up and, oscillating through the primary coils of the tuner to the earth connection, set up surges of electric energy in the telephone receiver corresponding to the voice at the transmitting station.



Los Angeles Automobilists Experimenting with Wireless Telephony from Automobile

AN ARAB "WIND TOWER"

To obtain relief from the intense summer heat, the Arabs living in the towns of Bushire and Bunder Abbas, on the Persian Gulf, equip their mud-walled homes with ingenious "wind towers." These are tall and hollow

The "Wind Tower" of an Arab House on the Persian Gulf

structures above the living room of the house, their sides being provided with shutterlike slats. An open air shaft runs down from this tower and enters the room through the ceiling, deflecting a current of air downward when the wind stirs. A woven brush mat, saturated with water, is often placed over the lower opening of the air shaft, and this cools the air as it enters the room.

STANDS ON HIS HEAD ON SKYSCRAPER

Among the structural iron workers engaged in erecting the steel skeleton of the 22-story Second National Bank

Copyrighted by Hal Harte

Acrobatic Structural Worker Stands on His Head on Top of Upright 160 Ft. above Street Level

building in Toledo is an aerial acrobat who even shakes the nerves of his fellow workers by some of his "stunts." He was photographed recently while balancing on his hands on the top of a steel upright which had reached a height of 160 ft. above the street level.

NEW ZEPPELIN DIRIGIBLE BREAKS ALL RECORDS

One of the new Zeppelin dirigibles, built for the German navy and known as "L1," recently flew 31 hours, in which it traveled 1,200 miles, making a new record for duration and distance. It started early in the morning from Friedrichshafen and flew all day through northern and western Germany in a dense fog, then sailed over the North Sea at a speed of 62 miles an hour.

The routine on this airship is like that on a warship. The officers and crew keep four-hour watches, eat at mess tables, and sleep in hammocks. Under the car of the naval Zeppelin is a bomb platform. Experiments with this airship have demonstrated that it can drop 1,320 lb. of explosives without affecting its equilibrium.

A DURABLE ARTIFICIAL LEATHER

It is encouraging, when contemplating the rise in the price of leather, to know that the efforts to produce a good substitute for leather are meeting with considerable success. A prize of $1,000 has recently been awarded a Belgian inventor by an agricultural committee of Terni, Italy, for an artificial leather said to possess not only the resistance and elasticity of natural leather, but its durability of wear. The process of manufacture consists in impregnating stout cotton cloth with tannic albuminoid substances.

POWER DEVELOPMENT AT NIAGARA FALLS

The hydroelectric companies on the Canadian side of Niagara Falls are all extending their plants for the utilization of all the water available for power purposes under the existing treaty between Canada and the United States. The development of the American companies, however, is practically at a standstill, as they are now using all the water so far allotted to them by the

Secretary of War. The United States government shows no inclination at present to grant the additional water it has at its disposal under the treaty.

FASTER BULLETS FOR NEW ARMY RIFLE

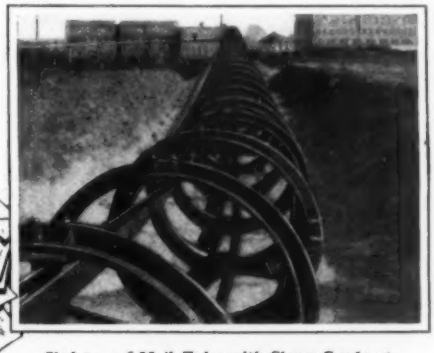
The British army will soon be equipped with a new rifle which will have a barrel 2½ in. longer than the present model, and its caliber will be slightly decreased, which all tends to increase the muzzle velocity and penetrating effect of the bullet; it being estimated that the former will be increased by about 540 ft. a second. The new rifle will be about 3½ oz. heavier than the present type.

Curved Section of Boston's Electric Mail Tube

BOSTON'S NEW ELECTRIC MAIL TUBES

If experiments at present being conducted prove successful, Boston will, within a year, have an underground electrical tube service for the transportation of mail and parcels of all descriptions, which will greatly facilitate the handling and quick delivery of mail as compared with the pneumatic system now in use.

This will be a new monorail system, in which 7-ft. cars will be shot through a 30-in. underground tube at the rate of 40 miles an hour. Experiments with the device have shown its practicability. The cars, in which mail or parcels are to be placed, are much larger than those used in pneumatic systems, their length being no less than 7 ft., of which three are occupied by the motor compartment. The inside dimensions of the mail compartment are 2 by 2 by 4 ft., which is ample to accommodate a whole sack of mail, thus doing away with the time-wasting dividing up of its contents into small packages as is necessary for transportation through the 8-in. pneumatic tube. Loaded, the cars are expected



Skeleton of Mail Tube with Sharp Grade at One of Terminals

to be able to take grades of 40 deg. or even more.

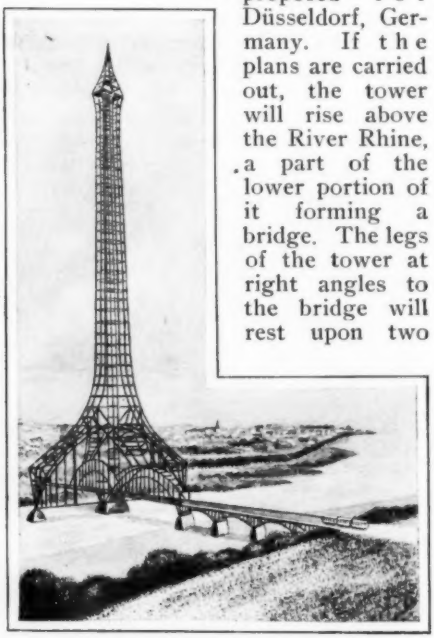
The tube itself is simple, 30 in. in outside and 24 in. in inside diameter. In it the cars will run on a single rail gripped by a two-flanged wheel, while two flat wheels at the sides, gliding on supporting rails, insure smooth and steady motion. The power is conveyed to the motor from an overhead flat steel band against which slides a trolley not unlike the shoe used on elevated trains for clutching the third rail.

It is considered possible that the department stores may avail themselves of this new system for their parcel deliveries.

¶The sale of the library of the late Robert Hoe, which is said to be the greatest auction sale of books ever held, came to an end recently. When the last book was disposed of, the sales totaled $1,932,060.60. The sale, which was divided into four sections, extended over 18 months.

HIGHEST TOWER IN WORLD PROPOSED FOR GERMANY

A great steel tower that will rise to a height of 1,600 ft., surpassing the Eiffel Tower by more than 600 ft., is proposed for Düsseldorf, Germany. If the plans are carried out, the tower will rise above the River Rhine, a part of the lower portion of it forming a bridge. The legs of the tower at right angles to the bridge will rest upon two stone piers, which will lie about 650 ft. apart on a line with the central pier of the bridge in the middle of the stream. The arches at the base of the tower will be 300 ft. in height. The top platform, which will be 160 ft. below the extreme summit, is to be 80 ft. square.



A 1,600-Ft. Tower Projected for Düsseldorf, Germany

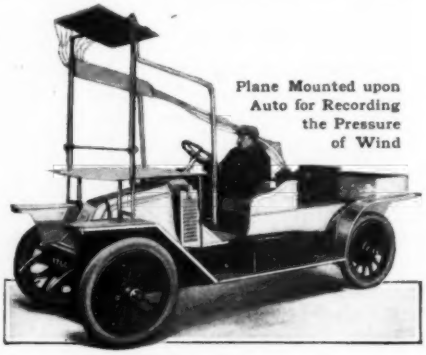
The tower will be used for scientific purposes, and will have a wireless installation in its top.

"WALKING CLUB" ORGANIZED TO FIND CITY'S FAULTS

A little boy in Fort Wayne, Ind., was struck by a train while on his way home from school, sustaining injuries that will make him an invalid for life, and out of this distressing accident has been developed a "walking club," the main purpose of which is to find that city's faults and see that they are corrected. "If," said the people of Fort Wayne, "we did not know how bad conditions were at the railroad crossing in question, then, perhaps, there are other things about the city, of which we know nothing, but that likewise require correction." So the "See Fort Wayne First" walking club was organized, and the idea caught on like wildfire, with the result that the people are learning of conditions about their own city that they never suspected. The walking tours are made on Sunday afternoons, the routes being planned in advance.

MEASURING WIND PRESSURE ON AEROPLANES

A new form of apparatus for measuring wind pressure upon surfaces such as the planes of an aeroplane, is shown in the illustration. The plane is mounted upon an automobile so as to secure conditions nearly similar to those with which an aeroplane has to contend while in the air. At the top is the test plane of wood, which is set upon pivots at various angles. In the board are a number of small holes, each of which is connected by rubber hose to a separate pressure gauge within a box, and this hose transmits the wind pressure to the gauges. The automobile is run over two pieces of rubber hose spaced apart so as to work a



Plane Mounted upon Auto for Recording the Pressure of Wind

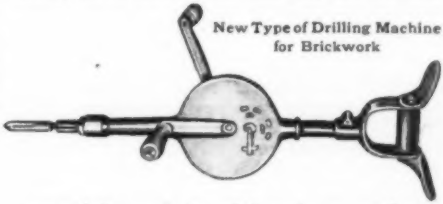
pneumatic recording device which registers the exact speed. At this precise moment the shutter of a camera inside the pressure-gauge box is automatically worked so as to take a photograph of the row of gauges with their scale. The device is being thoroughly tested in order to secure information of the greatest value to both builders and operators of aeroplanes.

MOTION-PICTURE SHOW ON WHEELS

A complete motion-picture outfit mounted upon a motor truck for moving the show from place to place among the smaller towns where electric lights are not used, has been put in successful operation by a progressive Oregonian. The vehicle has a 25-hp. gasoline motor, a 110-volt dynamo to produce the electric current, and the entire outfit weighs about 1,500 pounds.

QUICK-ACTION DRILL FOR BRICKWORK

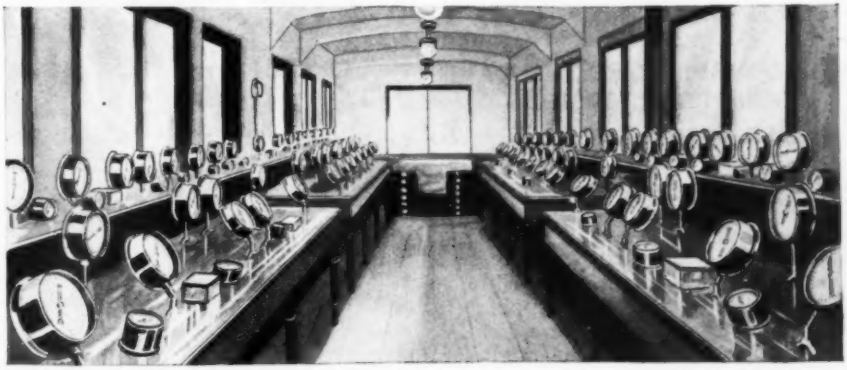
A tool for drilling holes in brick, stone or cement, which faithfully reproduces the hand-hammer and drill effect at a speed of at least eight strokes every time the crank makes one complete turn, has been placed on the market. The machine, which is so devised that a maximum speed of 20 blows per revolution may be struck, if desired, can be operated in any position; does not crack the surface of the material, and is claimed to make a neater hole than is possible by the hand-hammer and drill method.



New Type of Drilling Machine for Brickwork

PRESSURE GAUGES OF BIG FLOATING DOCK

A striking feature of the monster, new floating dock of the British navy, stationed at Sheerness dockyard, is the valve house, shown in the accompanying illustration. The 80 watertight compartments of the dock are grouped in sections, with separate sets of valves, so that each may be flooded or emptied independently. The valve house is placed at the forward end of the starboard wall and from it are con-



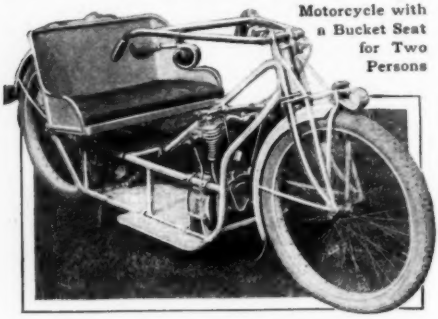
Courtesy Illus. London News

Pressure Gauges of Great British Floating Dock Which Indicate Height of Water in All Its Compartments

trolled all the valves and pumping equipments for the various compartments. By means of the numerous pressure gauges the height of the water in all compartments is determined.

TWO-PASSENGER SINGLE-SEAT MOTORCYCLE

The bucket seat has taken the place of the saddle on several European makes of motorcycles, but it apparently



Motorcycle with a Bucket Seat for Two Persons

remained for a young American motorcycle enthusiast to construct a machine having a seat of this type sufficiently large to accommodate two persons. The center of gravity of the machine is low, and the engine is mounted transversely, which is said to greatly facilitate cooling, as well as making a more even distribution of weight. The 7-hp. motor is started by cranking, and the drive is through a bevel-gear countershaft and thence by chain to the rear wheel. The seat is 30 in. wide.

HOTEL DISPLAY ROOMS HAVE DISAPPEARING BEDS

One of the Denver commercial hotels has many of its sample rooms so arranged that all evidence of the rooms being slept in can be removed during the display hours. Many of them have bed alcoves into which the dresser, chairs, etc., may be moved, while a number of others have disappearing beds. There are also 12 large display rooms which, by the drawing together of folding doors, form combination display and bedrooms.

HOW SEALS CUT STEPS IN ICE CAKES

How seals cut steps in the perpendicular sides of ice cakes in order to rise from the water for the purpose of breathing was recorded by members of Captain Scott's antarctic expedition with the aid of a moving-picture machine. It was discovered that the seals, which formerly were supposed to leave the water by leaping, actually cut steps in the slippery surface with the great canine or eye teeth. As soon as the teeth are placed in position, the head is moved rapidly from side to side until the ice has been cut away sufficiently to afford a footing for the front flippers of the animal. Each step has to be laboriously cut after this fashion until the body is far enough out of the water to be thrust up the rest of the way by a kick of the hind flippers.

FIELD TELEPHONE OF THE MEXICAN ARMY

In chasing, or being chased by, rebels through the lonely, cactus-covered hills of Mexico, the federal army makes constant use of the field tele-

Mexican Army Officer Using a Field Telephone

phone. In the illustration, an officer is shown setting up a field instrument, grounding the wire by means of a bayonet.

Girl Student of Philadelphia College of Pharmacy Crossing a Stream on a Two-Rope Bridge, as an Exercise for the Nerves

GIRLS CROSS RIVER ON TWO-ROPE BRIDGE

Exercises for the nerves as well as for the muscles of the body play a prominent part in the program arranged for both the men and women students of the Philadelphia College of Pharmacy by the physical director of the institution.

Saturday "hikes" are especially arranged to find places suitable for nerve-gymnastic "stunts," or, to express it more clearly, for gymnastic feats of a sufficiently daring nature to require steady nerves. Such a "stunt" is shown in the accompanying illustration. Two ropes were strung across a small river that winds its way through the neighborhood of Norwood, and the students of the nerve-gymnastic class, men and women alike, were ordered across several times. The illustration shows one of the girl students making the passage.

PRACTICAL DEMONSTRATION OF AUTO MUD SLINGING

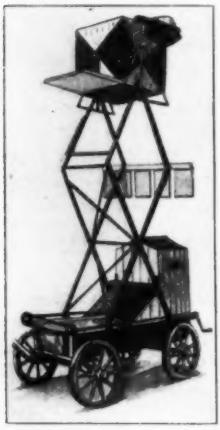
Throughout the civilized world there has recently been an uproar over the mud-splashing proclivities of automobiles driven at high speed over wet streets or roads. The owners of autos generally pay little heed to the complaints that are made, as they are not in a position to see and, consequently, are apt to disbelieve the statements of bystanders. In California an irate and mud-bespattered pedestrian recently made a picture of an automobile going

Photograph Made in California Showing How an Automobile Splashes Mud and Water

through a small stream of water, which accurately shows just what the splash of an automobile wheel is. The front of the car is almost obscured by the mass of spray and muddy water thrown up by the wheels.

A PORTABLE OUTFIT FOR PIGEON-PHOTOGRAPHERS

A man who uses carrier pigeons as aerial photographers has constructed a light horse-drawn vehicle for the conveyance of the pigeons and all the necessary paraphernalia of photography. The box at the top of the collapsible standard is a pigeon loft. The little house erected on the rear of the wagon is a dark room.



In using pigeons as photographers, the camera is attached to the bird so that it points downward when the bird flies, and the shutter is worked automatically by a timed mechanism.

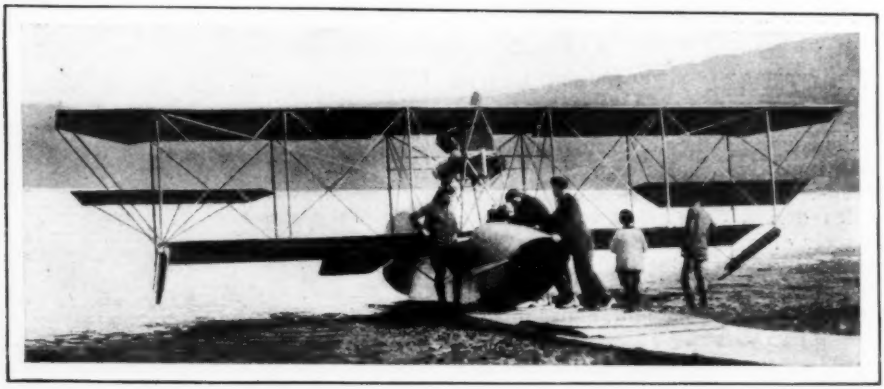
TO SAVE ANCIENT ENGLISH BRIDGE OF RIVER DEE

The foundations of the ancient Dee bridge, crossing the river of that name at Chester, were found to be in an unsatisfactory condition recently and measures are to be taken to preserve the structure. The old bridge dates from 1280 and is one of the oldest still in use in England. In preserving the bridge, the loose material between the stones is to be removed, the cracks are to be filled up with cement, and an invert of blue brick in cement, 9 in. thick, is recommended throughout.

THE UNITED STATES ARMY'S "FLYING BOAT"

The "flying boat," constructed for the U. S. army by Glenn Curtiss, completed its official tests successfully. The climbing test, requiring a climb of 150 ft. per minute, was accomplished when the machine rose to a height of 1,200 ft. in 6½ minutes. The average speed in a two-hours' test was 54 miles an hour, carrying a total weight of 900 lb.

This machine is of the latest "flying-boat" type, and has several features particularly designed for military requirements. The engine is fitted with a starting device by means of which it may be started again while the machine is in the water. The boat portion of the machine has a peculiar shape.



Front View of the Flying Boat Constructed for the Army, Taken at Time of Test by Army Officers

Motor Car Built Like a Railroad Parlor Car and Used for Touring

Interior of Car Finished with Solid Mahogany and Draperies of Green Silk and Plush

LUXURIOUS MOTOR CAR FOR TOURING

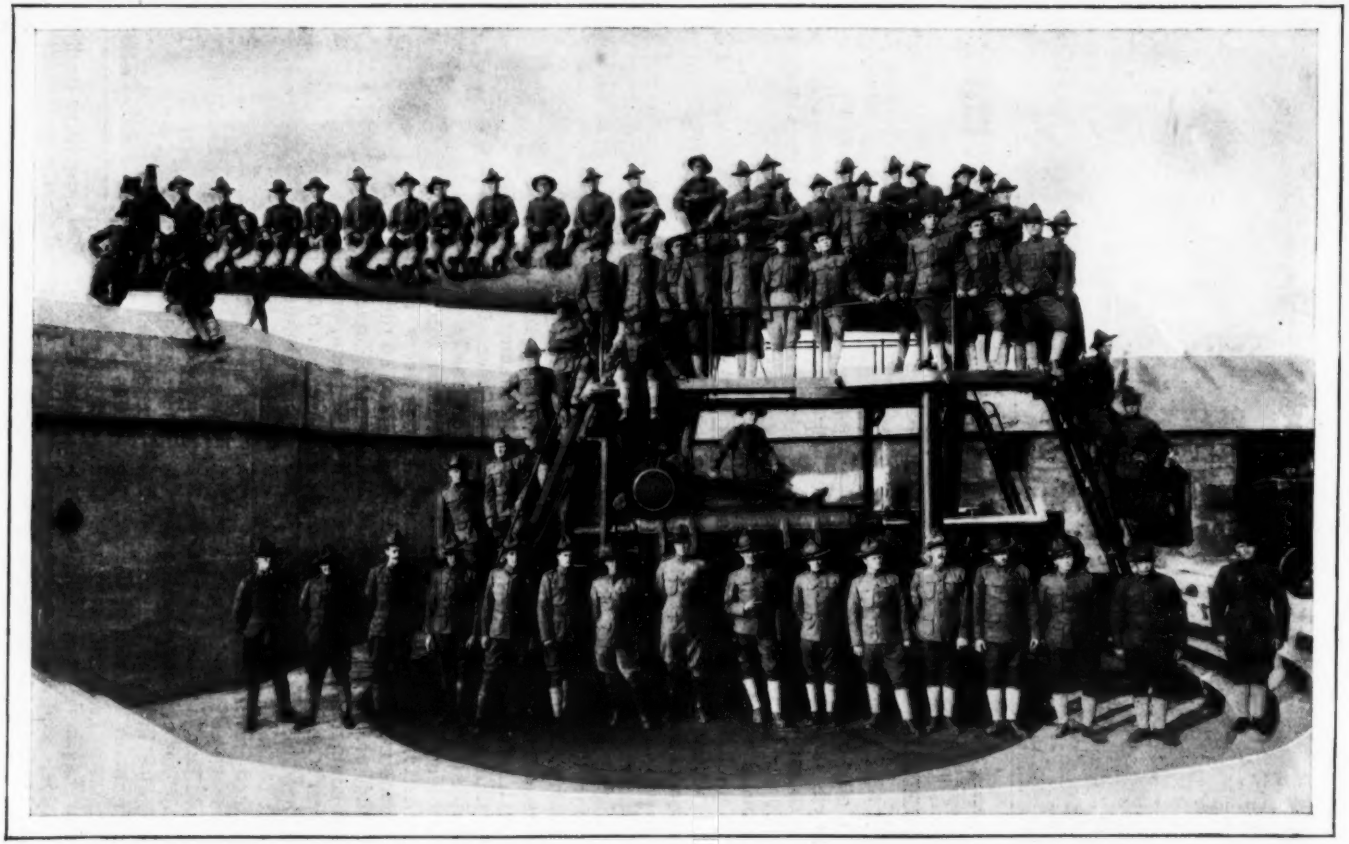
A motor-car truck, upon which is mounted a body whose interior arrangement is similar to that of a railroad car for private use, has been constructed by a large manufacturer of automobiles. The body of the vehicle, which was built for the accommodation of those who desire the acme of luxury when touring by automobile, is 25 ft. long, 6½ ft. wide, and over 9 ft. high. The car contains a stateroom for the driver; a ladies' stateroom, with sleeping room for five, and a men's stateroom, with space for four. The men's compartment is also used as the dining and smoking room, and is provided with two extension tables and a folding desk. In the rear is the "kitchenette," with every convenience and device necessary for both storing food and preparing elaborate meals.

Each compartment is connected with the driver's quarters by telephone, and there are also a number of electric call bells. The interior of the car is finished in solid mahogany with draperies of silk and plush trimmed with gold lace, and the floor is covered with a green carpet to match the fittings. The lighting system consists of six lights on the front of the car, two electric, two gas, and two oil; and the rear has a red tail light, an electric dome, and two railway-signal lights. Under the body are five lockers containing planks to strengthen weak bridges and a complete camping outfit of awnings, ropes and pickets for emergency cases. The car will carry 25 people on short trips, and for long journeys there are ample accommodations for 11, including the driver and cook.

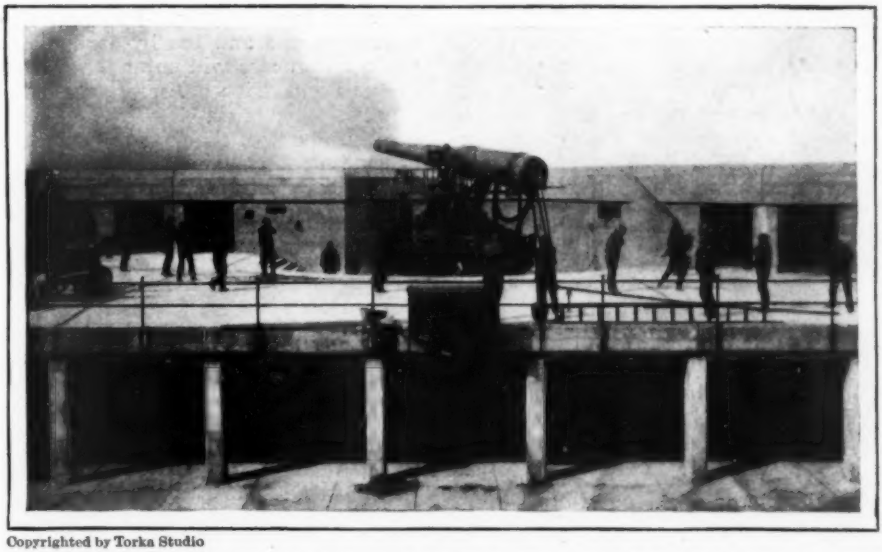
GROWING THREE OAKS FOR TOWN SYMBOL

The three trees shown in the accompanying picture represent a long-continued effort on the part of a Michigan town, Three Oaks, to perpetuate a symbol of its name.

Three Oaks originally was named for three oak trees which stood on the land now occupied by the town, but all three rotted away to the root, and since then the townspeople have been anxious to replace them with three young and vigorous trees. Several attempts resulted in failure, but now three healthy young oaks stand in the pretty little park of the town, and give promise of long serving as a memorial of the fact.



Big gun of Battery Kinzie, with a company of coast artillery assembled about it. The battery, which was completed a few months ago, is the most modern on the Pacific coast, and is located on a sandy point jutting out from Fort Worden, on Puget Sound, overlooking the strait of Juan de Fuca, the international waterway between the United States and British Columbia. A ship within seven miles of the entrance to Puget Sound would be within the range of the battery.



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Firing one of the great guns at Fort Worden on Puget Sound. The guns are of the 12-in. disappearing type, weigh 52 tons and fire projectiles weighing 1,064 lb., which, with a full service charge, cost $600 each.

STRUGGLING TO FEED THE VORACIOUS OIL ENGINE

By J. C. MILLER, M. E.

No sooner had American manufacturers ceased reading of the remarkable progress made abroad in power production by crude-oil engines, than notice came to them that contracts for fuel oil would not be renewed. Scarcely had the shipowners learned of the most successful voyages of the new oil-engined coasting ships, when the demands of gasoline engines for oil took from them the necessary fuel. Then a rush took place for new contracts with producers not in the old combination, and sooner or later they, too, will awake to the greater possibilities of their product, when refined. Then fuel oil, as such, will be of the past.

Many a consumer, not well posted, will place the blame for this shortage on the great oil-controlling combination, but really the working of the still older controlling combination of supply and demand may be seen again. Demand is close to supply, and with the growing demand for gasoline, prices for refined products are at the highest level yet attained. This new demand for a higher-class product has likewise cut off the supply of raw material from other users, that the costlier product may be supplied.

To the motor vehicle we must look as the greatest consumer of the high-class product, gasoline. There were in the United States in September, 1912, 990,000 gasoline vehicles. A low average for miles traveled per gallon would be 15, and for a year 4,500 miles would be a low mileage. We must, therefore, provide 6 bbl. of fuel for each machine, or about 6,000,000 bbl. of the refined product per year, and this is far beyond any demand even dreamed of a few short years ago. Something must be done and this something has been started with the results above stated. The situation is even

worse abroad than in America, for gasoline there, after rapid rises, is selling for 37.5 cents a gallon and the quality is growing poorer.

No oil is produced in England and a Royal Commission is now considering its use for the navy. Private parties are building storage tanks for seagoing vessels' fuel, and it appears as if every agency were making a combined attack on crude oil.

In the refining of crude oil, each gallon will produce about 12 per cent of gasoline above .74 specific gravity. This percentage varies with different oils, but the amount given is a fair average, with California oil producing very much less and Illinois oil producing more. The world's total production of crude oil in 1910 was 327,000,000 bbl. and of this the United States produced 209,000,000 bbl. The railroads of the country in 1909 used 24,000,000 bbl. of fuel oil, which was an increase of 23 per cent over the consumption in the preceding year. Twelve million gallons of gasoline were refined from crude oil in 1909 and 4,250,000 bbl. of oil were exported the same year.

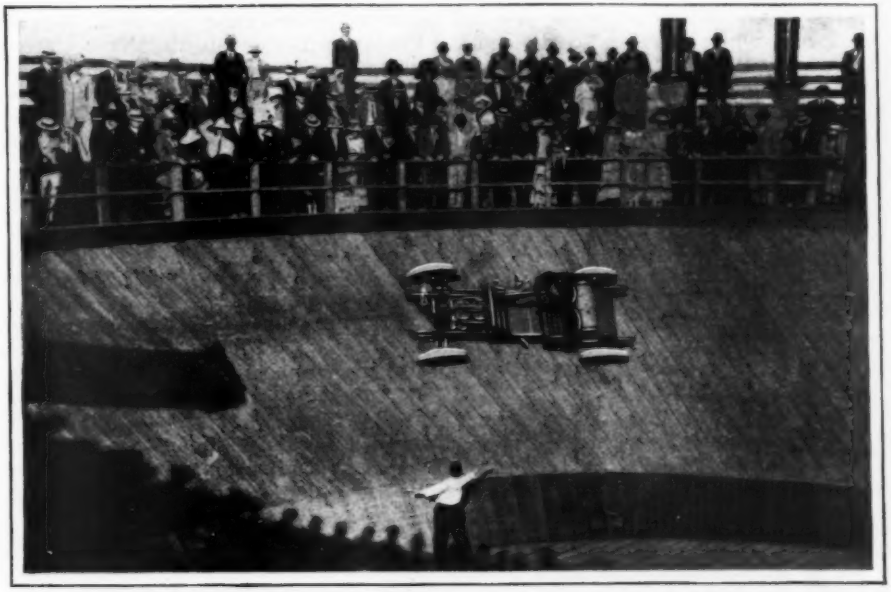
Thus it can be seen that to this country the nations of the world must look for their petroleum supply, and heavy foreign demands have already been made. On the Pacific coast the old steam vessels of the British Columbia lines have been changed to oil burners, and the new boats are being built for oil. Some sections of the interior western Canadian railroads are now burning California oil in their locomotives in place of coal, which is too costly for this use because of heavy transportation charges. To anyone who requires liquid fuel for some use or other the situation is truly one of concern. The oil supply from eastern fields is decreasing. The great oil companies of the country have devised new methods for conserving and producing larger amounts of the more strongly demanded grades, and it may be taken as a settled fact that never again will gasoline sell at prices formerly prevailing. Crude-oil burners will never again be operated at the lower prices of bygone days. Producer gas, coke-oven gas and the by-products of the coke process will enter the market as fuels and drive oil before them because of their cheapness. The petroleum products of the days to come will become more valuable than ever.

The wonderful strides of the new fuel, benzol, are attracting general attention now in Europe, because of this oil situation. Benzol has been known for years as a laboratory chemical, much used in the arts as a solvent, but never looked upon seriously as a fuel, for sufficient demand has never existed to induce coke manufacturers to install plants, that the liquid might be produced cheaply.

Benzol is obtained in the manufacture of coke by the so-called Solvay process and is but one of the many by-products that make this process profitable. In years, not long past, a traveler through Pennsylvania could look out and see the many beehive coke ovens sending out their smoke and gases into the air, and from these waste gases, which are saved in the more modern process, benzol is condensed. The product was discovered or isolated in 1845 and for years experiments were made to find methods of condensing it. In later years, this gas is absorbed by liquids which, after successive distillations, yield benzol as a fluid, having a peculiar smell, slightly stronger than that of gasoline.

In a recent test of benzol in a commercial motor car on the noted Brooklands track an increase in mileage of 26 per cent per gallon over ordinary gasoline was secured, with no adjustments to the carburetor. One fuel was alternated with the other, and while gasoline carried the car 19.46 miles per gallon, the new fuel, under exactly similar conditions, showed 24.68 miles per gallon. Thirty-five miles per hour was attained by the car with gasoline, while 55 was reached with benzol. Strange to say, all the output of the one big English plant which is distilling the new fuel is contracted for by foreigners.

Germany has taken great interest in



Automobile Racing on Soup-Bowl Track Which has a Diameter of Only 70 Feet

the new fuel and Prince Henry of Prussia is pushing its manufacture. The German government has just ordered a benzol plant to be erected on government property, which will use government coal and be capable of producing no less than 6,000,000 gal. of benzol per year.

England will need 40,000,000 to 50,000,000 gal. yearly, and as it has the coal fields necessary and is now producing the coke, it is fair to assume this waste product will be recovered and replace the petrol, otherwise gasoline, now wholly imported.

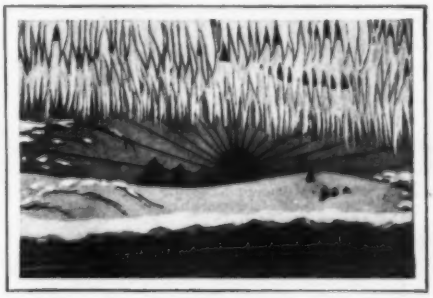
In the United States the rising price of gasoline is also stimulating the coke plants to new endeavor along the line of benzol production.

FIFTY-FIVE MILES AN HOUR ON SOUP-BOWL TRACK

An automobile speeding at 55 miles an hour around a soup-bowl track having a diameter of only 70 ft., and a slant of 75 deg., is a sight watched daily at a resort near Los Angeles. The car is taken to the floor in a specially designed elevator, two or three turns are made on the level, and the ascent begins as soon as a sufficient speed has been attained.

ARTISTIC PICTURE MADE OF PAPER

A picture, which was made almost entirely of paper and may be used to decorate the wall of a store, or house, is shown in the illustration. The beautiful effect was produced by using

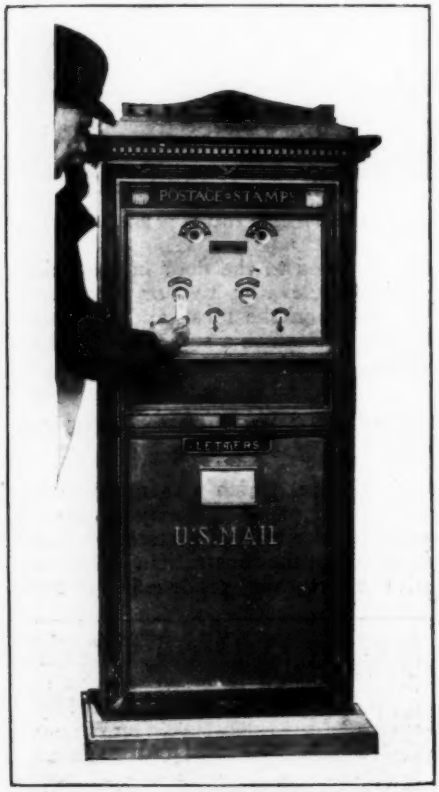


This Picture was Made Almost Entirely of Crepe Paper

crepe paper, in brick design, for the wall, and white jewelers' cotton gave the appearance of snow upon the coping of the building and upon the trees. The sky is represented by gray crepe paper; orange-red tissue covers the sun, while the icicles are white crepe, cut as shown and fastened to real grapevines. An outline of the picture was first sketched in pencil on a large sheet of paper, and each color of tissue or crepe desired was cut out and pasted in its proper place upon the pencil sketch.

POSTAGE-STAMP VENDING MACHINE ADOPTED

An entirely new postage-stamp vending machine, which has been adopted by the government, will, in



Postage-Stamp Vending Machine Adopted by the Government

course of time, supplant hundreds of employes and close the retail stamp windows in many of the larger post-offices of the country. One or more wholesale windows will be maintained for those who purchase stamps in quantities, or who use the less common denominations. This machine will also find a place in the substations, and possibly in the big department stores. There are no levers or knobs to be worked by the public, the mechanism of the machine, which sells one and two-cent stamps, being operated by a trigger, pulled when the pennies are dropped in the slots.

NEW YORK'S SKYSCRAPER APARTMENT HOUSES

New York apartment houses, following the example set by office buildings, are steadily growing to greater height, the latest skyscraper of this class having 17 stories. Apartments in New York cannot be built taller than 1½ times the width of the thoroughfare they face. Park avenue, on which the apartment house in question stands, is 140 ft. wide, including the parking place in the center over the railroad cut. It is the widest thoroughfare in the city, and thus this apartment, 210 ft. in height, is the tallest that may be erected at present.

Among the features of this skyscraper apartment house is a separate hall in each apartment for the servants, so that they may go from one end of the apartment to the other without seeing, or being seen by, persons in the entertaining or living rooms.

¶The coal lands of Cambria County, Pa., are in such demand that the coal rights under graveyards are being sold off. One cemetery in the southern part of the county is said to cover a bed of coal that extends 500 ft. down.

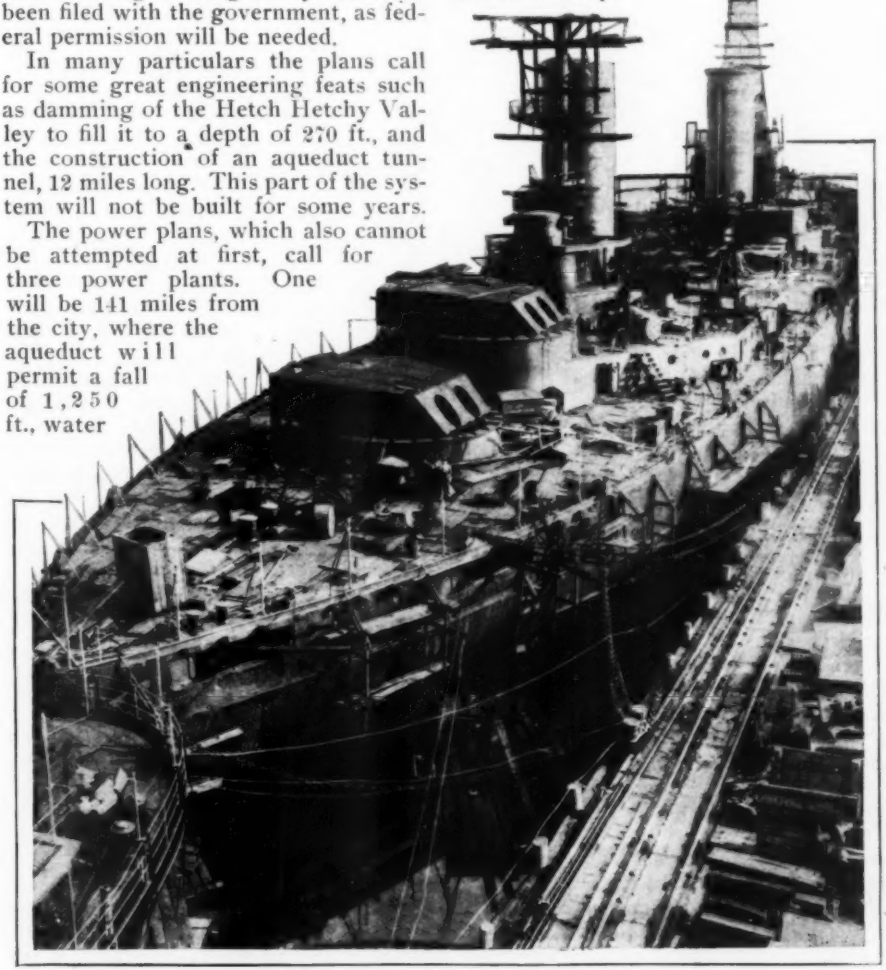
ENORMOUS POWER FROM WATER MAINS

The city of San Francisco is planning to have for sale within a few years for lighting and manufacturing purposes electric power to the amount of 157,000 hp., all developed as a side issue in connection with its proposed Hetch Hetchy Valley water supply. Complete plans for the immediate and final building of the great system have been filed with the government, as federal permission will be needed.

In many particulars the plans call for some great engineering feats such as damming of the Hetch Hetchy Valley to fill it to a depth of 270 ft., and the construction of an aqueduct tunnel, 12 miles long. This part of the system will not be built for some years.

The power plans, which also cannot be attempted at first, call for three power plants. One will be 141 miles from the city, where the aqueduct will permit a fall of 1,250 ft., water to the amount of 400,000,000 gal. a day falling through. This will give 70,000 hp. every hour of the day.

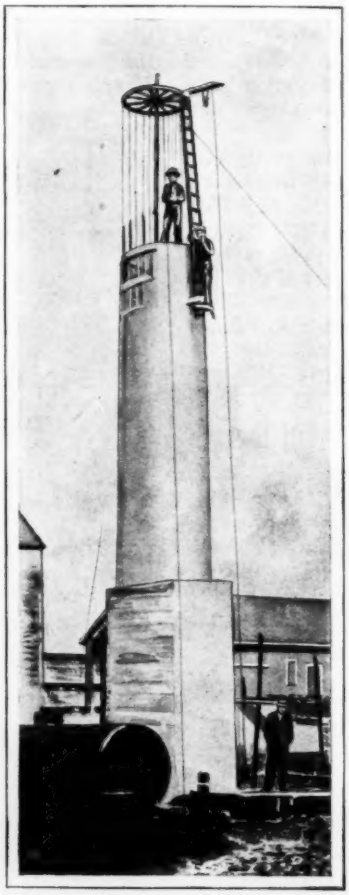
Nineteen miles farther along the aqueduct and away from the city, the same amount of water is available, and the net drop will be 1,325 ft., which will give 75,000 hp. The third plant will be at the tunnel from Hetch Hetchy.



Bigger than any battleship now in the United States service is the Argentine battleship "Rivadavia," which is nearing completion at Quincy, Mass. The armament is now being installed, and the dreadnought will soon be ready for her trial trip.

BUILDS CHIMNEY WITH WAGON WHEEL

The wagon wheel appearing at the top of the illustration of a concrete chimney recently erected in Traverse City, Mich., was used to keep the steel framework of the chimney in place while the cement was being applied. The wheel was raised to its position by means of a vertical shaft being passed through a section of pipe in the hub. Clamps and guy wires, attached to hooked bolts in the rim of the wheel, held the shaft and wheel securely in position. The hooked bolts also served as retainers for the vertical steel ribs, while a plank, fastened across the wheel, acted as a support for the hoist by which the concrete was elevated to the workmen.



Wagon Wheel Holding the Steel Ribs of Chimney in Position

SAVED FROM DEATH BY A MATCH

To be saved from death by lighting a match just as they were on the verge of drowning in the English Channel was the thrilling experience that recently befell two aeronauts of the Royal Aero Club of London. The two men almost lost their lives while making an attempt to fly across the channel in their balloon, which, at a height of about 4,000 ft. suddenly encountered a heavy rain and began to sink. The horrified passengers threw out every ounce of ballast on board and used all other means at their command, but the balloon continued to descend in spite of all their efforts to make it rise. Down, down, it sank, while those on board shouted with might and main, until it was about 50 ft. above the deep water of the channel. Still the frightened balloonists continued to shout, but they failed to attract the attention of anyone aboard the passing vessels. The helpless aeronauts were now within a few feet of the water and, just as they were about to resign themselves to their fate, they saw a light several hundred yards distant, which, as they learned later, came from the boat of some fishermen who were setting their nets for the night. The balloonists shouted again and again, but could not make the fishermen hear their cries. The basket of the balloon finally touched the water and, at this critical moment, one of the men discovered three dry matches in his pocket. One of these was struck and it went out instantly. The second one did likewise. The remaining one was struck and, fortunately, its tiny flame was seen by the fishermen who, thinking that it was a boating party in distress, shouted to them to row their boat alongside. To their utter astonishment they heard the aeronauts shout through the darkness that they were helpless in a balloon. Hurriedly cutting away their net the fishermen rowed with all haste to the disabled

balloon, which was fast settling in the water. After the balloon was ripped open to allow the gas to escape, the two exhausted men were lifted into the boat and taken ashore.

RENTING CARBURETORS A NEW BUSINESS

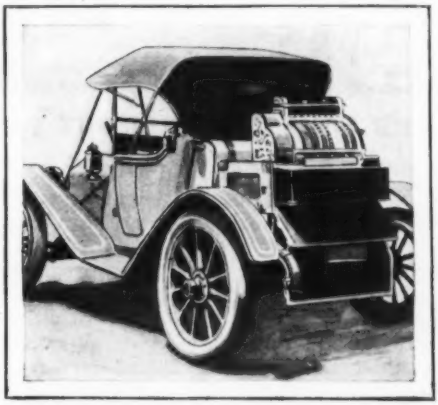
Renting carburetors for automobiles, instead of selling them outright, is the rather unusual business of a company in New York City. The monthly rental fee originally charged was equal to 50 per cent of the quantity of gasoline saved by using the company's device, and the minimum fee ranged from $25 up to $100 per month, according to the size required, but the fees have since been made arbitrary.

FATAL HEAD-ON COLLISION AT INDIANAPOLIS

Eleven persons in the two passenger coaches and the engineer and fireman of the passenger locomotive were killed in this head-on collision at Indianapolis recently. The collision was due to the fact that a switch was left open when the freight train drew onto the siding to let the passenger train pass. When the photograph here reproduced was taken, the bodies of the engineer and fireman were still pinned in between the cab and tender. Four clerks in the mail car were injured, but not seriously.

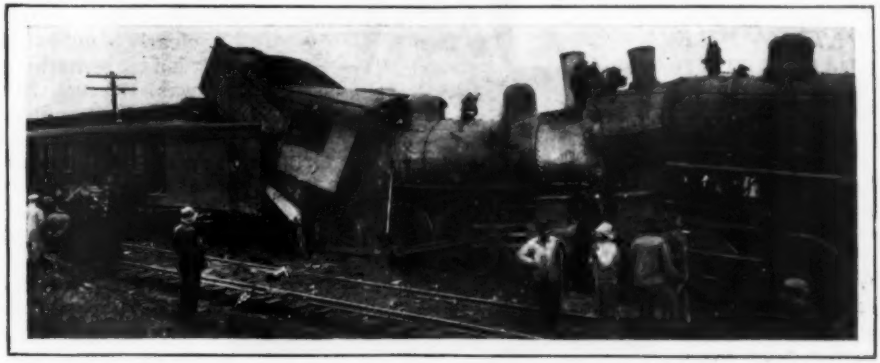
CASH REGISTER MOUNTED ON REAR OF AUTOMOBILE

Automobiles with a large cash register mounted on the back of each, protected by a trunklike box when not on display, have been furnished to a number of salesmen of one of the large cash-register manufacturers. With this equipment, the salesman can drive up in front of a store and show the proprietor the working of the largest cash register made.

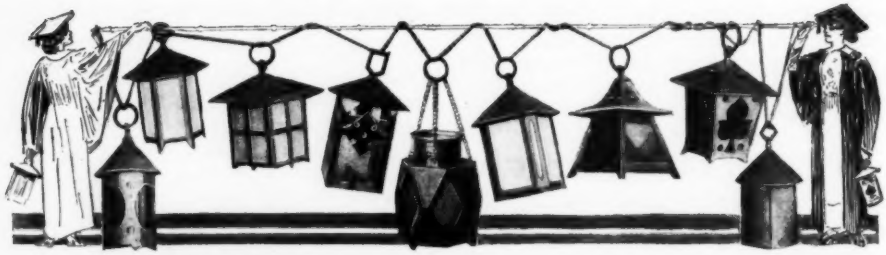


Cash Register Mounted on Motor Car, for Demonstration Purposes

¶In drop-forge plants there is usually a large surplus of exhaust steam from the hammers. An Ohio plant converts this waste steam into electrical power.



A Collision in Which the Engineer and Fireman of the Passenger Locomotive and 11 Other Persons were Killed

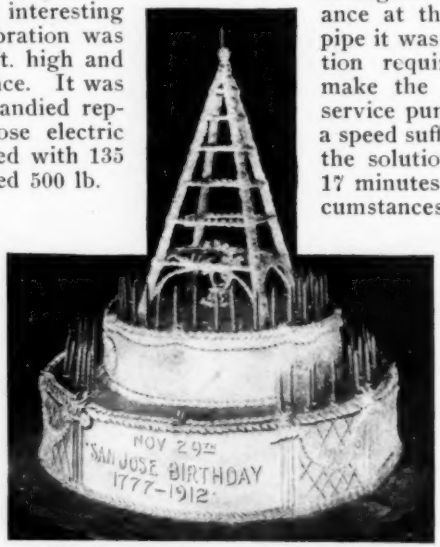


THE LANTERN CEREMONY OF BRYN MAWR COLLEGE

One of the famous student ceremonies of Bryn Mawr College is Lantern Night. On that night the freshmen, dressed in white and wearing their black caps and gowns for the first time in public, march noiselessly into the cloister and stand in a wide half circle against the buttresses of the library. Then the sophomores, each carrying a lantern, march in to the strains of an old Greek song, and present the lanterns to the freshmen. The lanterns chosen for the ceremony, always artistic in design, are of different pattern each year. Each freshman retains the lantern she receives as a valued keepsake, but there is always an extra one for the college, and the number of these has grown to such an extent that a department has been reserved in the trophy hall for their display.

A BIRTHDAY CAKE FOR A CITY

San Jose, Cal., held a public birthday celebration recently, the event being the 135th anniversary of the city, and the most interesting feature of the celebration was a birthday cake 4 ft. high and 12 ft. in circumference. It was surmounted by a candied replica of the San Jose electric tower, was decorated with 135 candles, and weighed 500 lb.



The Birthday Cake of San Jose's 135th Anniversary

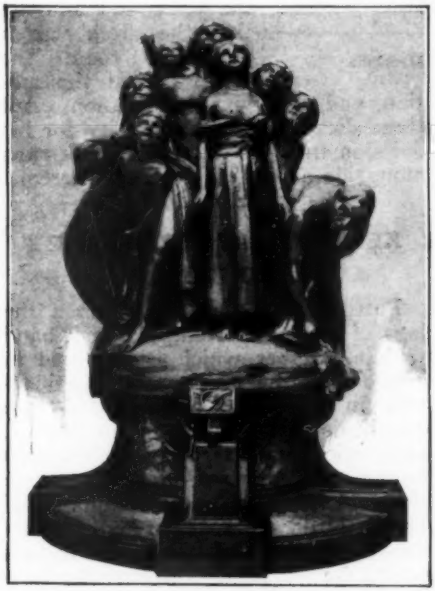
WATER - PIPE LEAKS FOUND WITH BLUE SOLUTION

That an ordinary blue coloring solution can be used for discovering leaks in wooden water pipes was recently demonstrated by an engineer who made an examination of the large wood-stave pipe through which water is brought to Quincy, Ill., from the Mississippi River. By pouring one gallon of a dark blue solution into the intake end of the pipe and noting the time of its reappearance at the other end of the pipe it was found that the solution required 37 minutes to make the passage, while the service pump was operating at a speed sufficient to have drawn the solution through in about 17 minutes under ordinary circumstances. As this result clearly indicated that something was wrong with the pipe, a diver was sent down to make a thorough examination. It was ascertained that the pipe had a number of large holes. After these had been tightly closed by means of boiler plate, rolled to the out-

side diameter of the pipe, and clamped into position with large screws, the pipe was again tested with the blue solution, which appeared at the discharging end of the pipe in just 12 minutes after it was poured in at the intake end.

TROPHY FOR LONG FLIGHT AWARDED

The Pommery trophy, which, together with a money prize of $1,500, is awarded twice a year to the airman who during the previous six months has made the longest flight with only a limited number of stops for fuel, was last won by M. Daucourt for his flight, on Oct. 6, 1912, from Valenciennes, in northern France, to Biarritz, on the Bay of Biscay, near the Spanish border, a distance, as the crow flies, of 528 miles. The trophy must be defended by the winner for two more periods, but cannot be won away from him unless some one surpasses the distance flown by him.



Pommery Trophy for Long-Distance Flight, the Figures, by Max Blondat, Depicting a Group Watching an Aeroplane

LIVE DOG AS PART OF A MUFF

Wearing a real live dog as part of a muff is a fad which may gain considerable headway among ultra-fashionable women in this country. An interesting combination is shown in the accompanying illustration. The spitz puppy seems perfectly at home in his little pocket in the rear of the big gray-wolf muff, from which he gazes at the passers-by and into the shop windows with his mistress. There is room for the puppy to cuddle down in the pocket if the weather is cold.

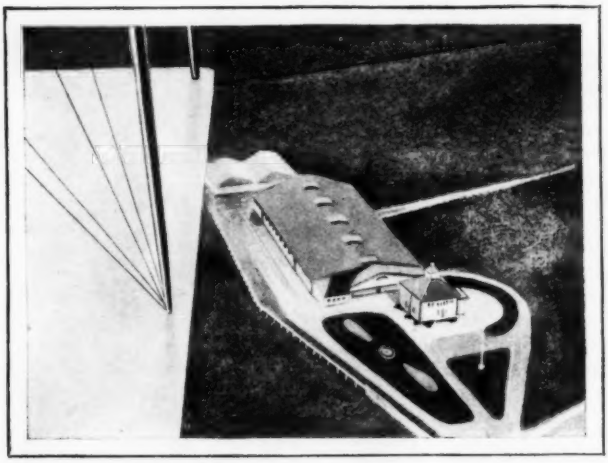
An Animated Muff

NEW SOUNDING BOARD FOR CHAMP CLARK

A new sounding board of heavy oak has been constructed and placed on Champ Clark's desk in the House of Representatives to withstand the powerful blows of the Speaker's gavel which completely ruined the old board during the last session.

AEROPLANE PHOTOGRAPH OF AEROPLANE PLANT

A bird's-eye view of the Euler aeroplane plant, Germany, as photographed from one of the Euler aeroplanes, is shown in the accompanying illustration. Upon the lawn at the front of the main building are flower groups arranged in the form of a Gnome motor with propeller attached. The factory building and hangars are of considerable size.



A View of Aeroplane Plant, Obtained from an Aeroplane

LONG COAL TRAINS DUE TO SCARCITY OF TRAINMEN

It has been said that the great length of the coal trains in the Pennsylvania fields is due not to a desire to break records, but to lack of trainmen. A train of 133 empty coal cars was recently moved from the Perth Amboy docks to the yards at Mahoning, Pa., for distribution to the mines. This train was 7,000 ft. long, and was drawn by two locomotives, a third pushing.

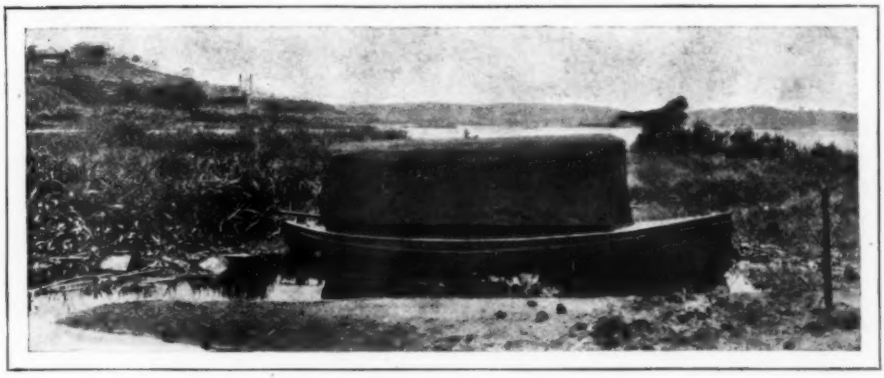
¶A balloon, 160 ft. in length, with a capacity for nine persons and made like the "Parseval," the German military dirigible, is being built in Austria for an amateur aeronaut of St. Louis.

COURT DECIDES THAT DITCH IS NOT PART OF ROAD

That a ditch is not part of the road, but a separate piece of construction, has been decided by a New York court in a case involving the payment of damages to an automobile owner by an insurance company. The automobile in question ran into a ditch and was damaged, and a jury awarded the full amount asked, $767. The insurance company then attempted to have this verdict set aside, claiming that the accident policy did not cover damage to the car through collision with any part of the road, and alleging that the ditch was a part of the road. The judge denied the motion, and, in giving his opinion, cited three dictionaries as authority for his decision that a ditch, although it runs alongside a road, is not part thereof.

KEEPING TAB ON BIRDS BY LEG BANDS

Putting aluminum bands upon the legs of birds and stamping each band with a number which is recorded in a book for the purpose of identification in case any of the birds are caught, is a plan in use by an English association that has been studying the migratory routes of birds for some time. Last year a total number of 11,400 birds were registered in this manner in England, while in America where the system has but recently been introduced, only 2,300 bands have been used. Although the plan has not been productive of any specially important results thus far, it has disclosed the fact that certain birds will reappear at places where they have not been for years.



Floating Island of Matted Vegetation in the Gatun Lake Carried by Winds to the Shore and Hemming in a Motorboat

FLOATING ISLANDS IN THE GATUN LAKE

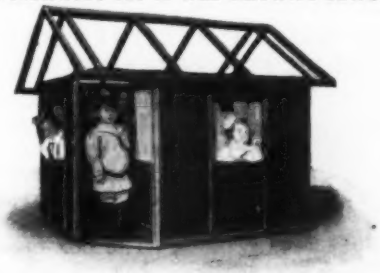
Floating islands of large size have been formed in the Gatun Lake at Panama, as the great artificial lake has filled up behind the Gatun dam, and while the development is only temporary, some of the islands are a minor nuisance at present. Freshets along the Chagres River, which is filling the lake, brought the lake level up to almost 60 ft. by the middle of December, and the rising water brought to the surface quantities of vegetation which carried with them some earth, so that much of the vegetation continued to grow and mat together. A few of the islands are firm enough to hold the weight of a person.

WHY PEOPLE KNOCK ON WOOD

The habit that people have of knocking on wood, such as a table or chair, was inherited from pagan ancestors, who believed that little gray gnomes lived in the earth, and, when they wandered through forests long ago, gently tapped on the bark of the trees for the good wishes of the fairies to protect them from the malice of the gnomes. The rustling of the leaves or the swaying of the branches was regarded as an answer promising protection.

PLAYHOUSE FURNISHED BY KINDERGARTEN PUPILS

This playhouse, used by the children of a kindergarten, was constructed by the pupils of a vocational school, and the furniture for it was likewise sawed



This Playhouse was Furnished and Decorated by Kindergarten Children

out by them. The kindergarten children themselves, however, put the furniture together, decorated the interior, and fitted it with all the appliances of the home, such, for instance, as a bed with stenciled linen, a stove, cupboard with dishes, and even an imitation telephone.

SELLING ICE OF GREAT GLACIER

One of the most famous glaciers of Switzerland, that of Saleinez, is being blown up and sold to residents of distant towns since the opening of the great St. Bernard railroad has provided a means for its dis-

View of the Nearly Completed Gatun Locks, Which Gives a Good Idea of Final Appearance

tribution at a profit. The great mass of ice is blasted with dynamite and the blocks are shot down an inclined passageway, almost a mile and a half long, to the bottom of the valley where the ice is loaded upon railroad cars.

AUTOMATIC SANITARY BREAD BOX FOR RESTAURANTS

A sanitary container for sliced bread, automatically operated, designed for tables and counters in restaurants, is here shown. The box or case has glass walls in a nickelplated frame. When a button at one corner is pressed by the diner the lid flies up and a slice of bread is presented. When the slice is removed the lid automatically drops and is locked until the button is pressed again. The box is constructed to hold about a dozen slices of bread, which it keeps fresh and moist. The standard upon which the bread is placed rises a distance corresponding to the average thickness of the slices every time the lid is raised.

THE NEARLY COMPLETED GATUN LOCKS

This general view of the Gatun locks, with the north end of the locks in the foreground, shows fairly well how they will look when completed. The water is held from entering the locks by cofferdams erected across the entrance and exit.

REQUIREMENTS FOR HYDRO-AEROPLANES AT MONACO

The international motorboat races at Monaco this year will include hydro-aeroplane events for the first time. The tests required of this type of craft before they may enter are rather severe. The motor must be started from the pilot's seat, a run on the water for 300 ft. must follow, then the craft must rise to a height of about 1,600 ft., returning to the water within an interval of a half hour. The last 350 ft. of the return to the water must be a "vol-plane," the motor being stopped, not throttled down, and then the machine must be hauled from the water by means of a crane or tackle from a boom.

¶It has been estimated that the grand total of business that will be transacted in the automobile industry and its allied accessory industries in the United States will be, in 1913, nearly one billion dollars.

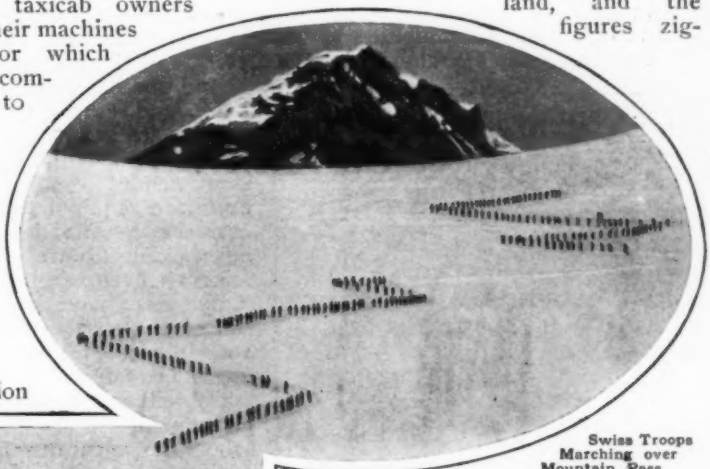
NO MONOPOLY IN COLOR FOR TAXICABS

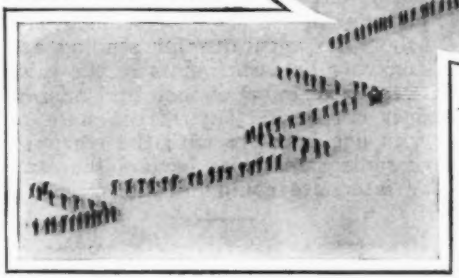
In rendering a decision in the fight of a taxicab company of New York to restrain other taxicab owners from painting their machines yellow, a color which this particular company claimed to have made distinctive in taxicab decoration, the court declined to draw a color line. The decision stated that it is too well settled to require extended discussion that no one may monopolize a particular color. The only cases in which the courts have recognized the exclusive right to a color are those in which the particular color is employed in combination with other characteristics, which, taken together, present a new and distinctive feature from that used by others engaged in a like business.

¶A New York man has built a motion-picture theater in his country home near Stamford, Conn. The theater, extending from the basement to the second floor, is 35 ft. long by 20 ft. wide. The dining room on the first floor is carried a few feet over the theater floor in the form of a theater box so that his guests may view the pictures while they dine.

MANEUVERING THE SWISS ARMY

The expanse of crusted snow is a pass near St. Gothard, Switzerland, and the figures zigzagging across it are fortification troops of the Swiss army in marching maneuvers.





Swiss Troops Marching over Mountain Pass

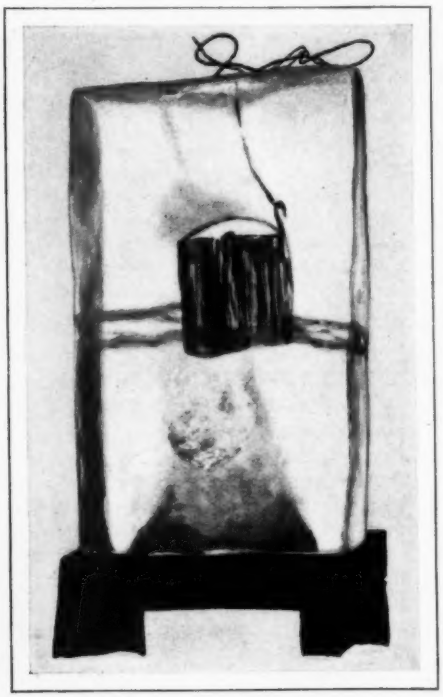
Although the population of Switzerland is not more than about three and a half million, that country is credited with an army, on a peace footing, of 208,000 men, which is nearly three times as large as the standing army of the United States.

JOSEF HOFMANN INVENTS AUTOMOBILE SPRINGS

Air cushions to take the place of springs on automobiles, invented by Josef Hofmann, the famous pianist, are now being manufactured. Four brass cylinders for compressed air rest on the axles under the four corners of the automobile body, taking the place of the usual steel springs. It is claimed that these cylinders, by means of pistons and soft-leather diaphragms, greatly reduce the swaying and jolting. It is likewise claimed that the invention is adaptable to all kinds of roads, regardless of the speed or weight of the machine.

BATTERY FOR LAMPS WORKS IN CAKE OF ICE

A battery for two small electric lamps, performing its functions while frozen in a cake of ice, was a novel feature of one of the exhibitors at the St. Louis automobile show. In the



Electric Battery for Electric Lamps Working in Cake of Ice

process of freezing the battery and the wire to the lights, the battery was suspended in a can of water, which was then refrigerated.

GOVERNMENT NOW CONTROLS WIRELESS

The practice of wireless telegraphy in the United States is now under government control, and the owners and operators of apparatus for radio communication under certain conditions are now required to obtain licenses. General amateur stations are restricted to a transmitting wave length not exceeding 200 meters, or about 650 ft., and a transformer input not over one kilowatt, but special amateur stations may be licensed to use a longer wave length on application to the Secretary of Commerce and Labor. Another section of the law requires all vessels bound upon a journey of 200 miles or more, and carrying 50 or more passengers, to have at least two wireless operators aboard, in order to insure constant attendance. These operators are required to undergo a government examination and obtain a government license. Another provision is that the sending of all messages in the same zone must cease after a call of distress has been sent out by a vessel, except those relating to the vessel in distress. The law does not apply, either afloat or ashore, to apparatus not equipped for sending, nor, ashore, to apparatus for sending and receiving between points in the same state, if the effect of such transmission does not extend beyond the state, or does not interfere with the reception of radiograms from beyond the state or interstate communications.

THE HAND-DUG OIL PITS IN SIAM

Although oil is said to exist in considerable quantities in Siam, the methods of obtaining it are exceptionally crude, and the commercializing of the crude product consists simply of selling it to villages bordering the oil areas. No effort has yet been made to sink regulation wells, the oil being obtained by digging pits about 60 ft. deep and bailing the oil from the bottom by means of a bucket or bag, attached to the end of a long pole made of bamboo stems fastened end to end.

¶Special cars, with nurseries for babies, were suggested as desirable new equipment for overland and limited trains on the Burlington system at a recent meeting of passenger agents.

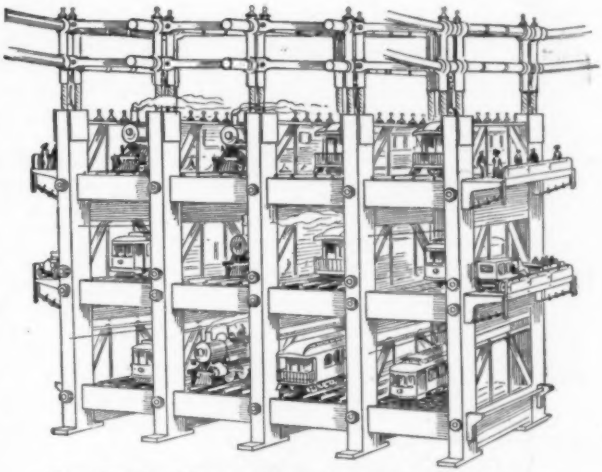
PLAN SUSPENSION BRIDGE NINE MILES LONG

Specifications for a suspension bridge to be built over San Francisco Bay between San Francisco and Oakland were recently presented to the San Francisco supervisors by a Los Angeles engineer. His plans call for a bridge 9½ miles in length, including its approaches in the two cities. This bridge, to be the longest and in every way most massive in the world, would be supported by 10 piers, placed 2,230 ft. apart, and it would cross the bay at an elevation of 180 ft. above the water.

The proposal has been indorsed by many important commercial bodies on both sides of San Francisco Bay, including the San Francisco Chamber of Commerce. The United States Senate acted favorably upon the measure, granting permission to land at Goat Island between San Francisco and Oakland, and also upon the Presidio military reservation in San Francisco. The estimated cost of the structure is $26,000,000, two-thirds of which would be equally borne by the cities of San Francisco and Oakland. It would necessitate a general election and subsequent bond issue by both cities to carry through the project, which would require seven years.

The bridge proper, supported by 10 steel cables cut through the top of the piers, would be a three-deck structure, 118 ft. in height and 180 ft. wide, and capable of accommodating 24 railroad tracks besides automobile ways and footwalks. The cables would be 20 in. in diameter with a tensile strength of 35,000 tons. The suspension of the bridge is planned so that, even should it sway with heavy winds, its decks would be kept parallel with the earth's surface.

The most notable feature of the bridge, in the opinion of the engineer who planned it, and likewise the most difficult problem to be encountered in the construction of any bridge across San Francisco Bay, lies in the establishment of foundations upon which the piers would rest. In the proposed bridge the piers would rest upon steel caissons 320 ft. long, 225 ft. wide, and 150 ft. in height; these caissons, to be constructed in drydocks, would be towed out to the points at which the piers are to rise. The caissons would have a weight of 80,000 tons but a buoyancy of 110,000 tons. By releasing the air within the caissons, they would naturally sink to the bottom of the bay and deep into the mud. The deepest pier, it is estimated, would sink to a depth of 116 ft. below the top of the mud at the bottom of the bay.



Cross Section of Proposed Suspension Bridge, Carried by Ten Overhead Cables and Having Accommodations for 24 Tracks besides Roadways and Footways

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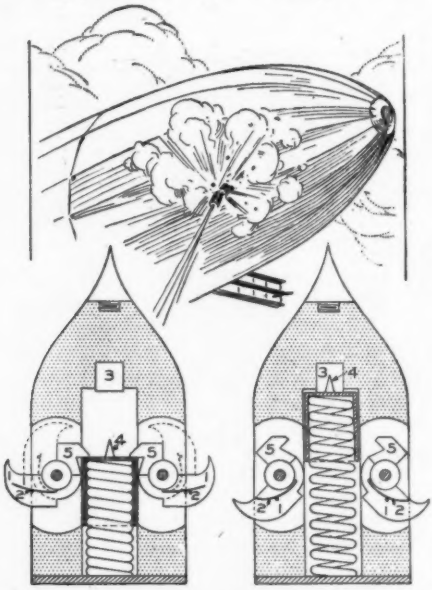
¶An agricultural paper says cheesecloth coverings for plants are better than glass, for the reason that the cloth permits the moisture to reach the plants and at the same time gives ample protection.

SHELL TO EXPLODE GAS IN BALLOON ENVELOPE

The invention by a German engineer of a projectile intended to explode a balloon or dirigible by igniting the gas in its envelope when striking it, was



Shell Which will Not Explode Until Hooks on the Side Tear through Balloon Envelope

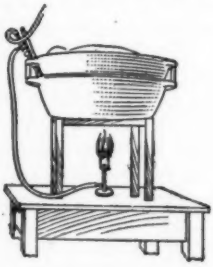
mentioned recently in this magazine, and the rather ingenious construction of the projectile is shown in the sketch herewith. The first diagram shows it as flying through the air, the side triggers having turned out after the projectile left the rifle, and the second, after having penetrated the envelope of a balloon. When leaving the barrel of the rifle, the claws (1) are pulled outward by the springs (2) and together with the dogs or pawls (5) form a sort of trigger which, when the projectile tears through the balloon fabric, are released, permitting the detonator (4), actuated by a powerful spring, to enter the charge of explosive contained in the part 3, exploding it and thus igniting the gas in the balloon. The projectile or bullet is fired by old-type Mauser rifles, having a bore of .43 in.

SENDING FIRE ALARMS OVER TELEPHONE WIRES

A system, by which fire-alarm signals are sent automatically over telephone lines to fire headquarters, is in operation in Rochester, N. Y. The system may be operated over telephone wires that are connected by operators at the telephone exchange; or it may be attached to the lines of an automatic telephone service which does not require an exchange operator. The new fire-alarm system has call boxes or stations somewhat similar, in size and shape, to those in general use, and they may be placed at any point where a fire-alarm box is desirable. These boxes, which do not require a key for opening the box or operating the interior mechanism, contain the transmitter and other parts necessary to send in an alarm by simply pressing the finger upon a key or button in the lower part of the box. When this button is pushed a clocklike arrangement within the box is set in motion, which causes a signal to be displayed upon the switchboard at the telephone exchange. The instant this signal is seen by the operator, the telephone wire from the call box is connected with another telephone wire leading to fire headquarters, where the alarm is registered in the usual way.

BABY TUBS MADE INTO INFANT INCUBATORS

A novel homemade infant incubator, excellently fulfilling its purpose, was made recently by a physician on the staff of a St. Paul hospital out of two infant bathtubs, a metal stand, a table, a thermostat, an incubator lamp, a length of rubber gas tubing, and a gas-regulating glass tube.



The outfit was mounted on a table like a chafing dish,

the gas heater being placed under it. One bathtub was partly filled with water, and in this rested the second tub, which contained the baby. The thermostat was regulated to keep the water at a uniform temperature of 104 deg. F.

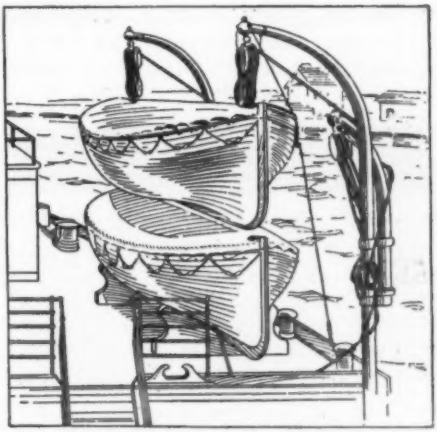
Any physician could assemble such an incubator in an emergency, and it would be found serviceable whenever a feeble or delicate baby requires constant application of artificial heat, as well as for premature infants.

ENERGY-COST METER FOR ELECTRIC UTENSILS

An energy-cost meter designed especially for use in the display of electric cooking utensils and small electrically driven machines, is now being exhibited in show windows and salesrooms. Its purpose is to give an authoritative answer to the question, "How much does it cost to operate?" This question is asked by the majority of purchasers of such devices, and to answer the question by connecting the meter to the device, at which the hand immediately points to the number of cents per hour that it costs to operate, is more assuring than a verbal answer. The meters are so calibrated that the reading of the dial corresponds to the station's rate for service.

DOUBLE DAVITS FOR OCEAN LINERS

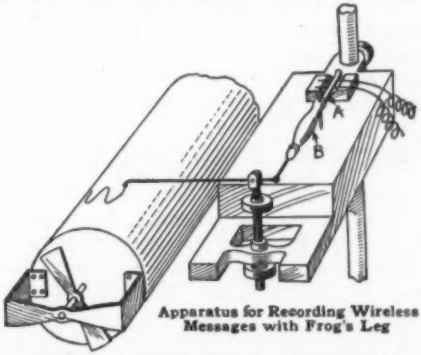
Following the sinking of the "Titanic" the suggestion was made that "nesting" the lifeboats would help solve the problem of storage space. Now double davits have made their appearance. As shown in the illustration an auxiliary set of davits is attached to the standards of the main davits, the purpose of the auxiliary set being to handle the lower boat when the first has been swung out.



An Arrangement of Double Davits for Ocean Liners

FROG'S-LEG RECEIVER FOR WIRELESS MESSAGES

Among the great number of wireless receivers recently constructed in France, some of which have been described from time to time in these pages, perhaps the most interesting is that devised by a French physiologist, in which a frog's leg, famous in the history of electrical science since the days of Galvani's epoch-making experiment, plays a leading part, serving, in fact, to record the wireless message on paper, something, it is stated, never before attempted.



Apparatus for Recording Wireless Messages with Frog's Leg

The sciatic nerve of the leg, cut be-

low the knee, is laid bare for some distance and connected into the microphone circuit of the receiver; one end of the leg is pinned securely to a base

Record of Time Signal, 10:47: One Dash, Two Dots, Repeated Four Times, and One Strong Impulse at the Exact Minute

and the other end connected with a pivoted lever, the longer arm of which faithfully produces a magnified record of the contractions and expansions of the muscles, caused by the electrical impulses, on the smoked paper of a drum revolved by clockwork.

By means of this simple apparatus the inventor, M. Ch. Lefeuvre, professor of physiology at Rennes University, has recorded the time signals sent from the Eiffel tower station in Paris, about 230 miles distant. A sketch of a record as made by the frog's-leg apparatus is shown herewith. All time signals sent from the Eiffel tower begin with a series of signs calling attention to the coming of the signal proper. Thus the 10:47 signal begins with a series of one dash and two dots, repeated four times and followed by the time signal, a short, abrupt wave.

It must be understood, of course, that this apparatus has no commercial possibilities, as the frog's leg and its nerve do not retain their sensitivity very long.

LAUNDRY CAR FOR RUSSIAN TROOP TRAINS

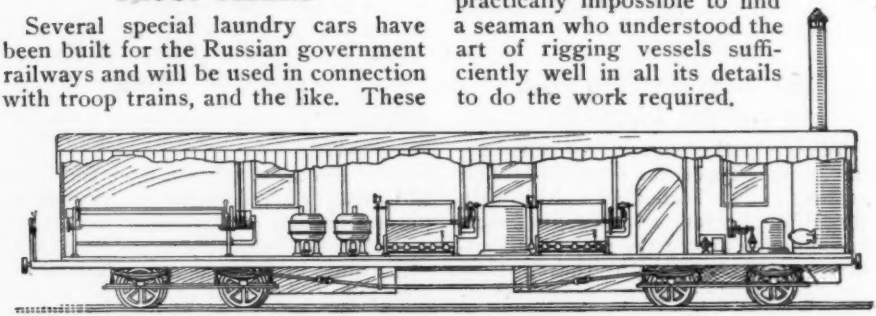
Several special laundry cars have been built for the Russian government railways and will be used in connection with troop trains, and the like. These cars are 62 ft. in length, and contain a steam boiler, condensing tank, a feed pump, cold and hot-water tanks, a soda-cleansing tank, two washing machines, centrifugal driers, a mangle, fan ventilator, and disinfector.

TIRE PROTECTION DURING WINTER INACTIVITY

Tire waste in the cold winter months, during which many cars are laid up, is very extensive, due to the fact that the majority of people do not know what precautions are necessary for protection. One of the automobile magazines advises that, in laying up a car, the tires should be removed from the rims, washed thoroughly with soap and water, carefully wrapped with strips of paper or cloth, and stored in a dark place kept as nearly as possible at a temperature of 50 deg. If the tires are to remain on the wheels for a considerable period in which the machine is out of service, the wheels should be jacked up and the air pressure in the tires should not exceed five pounds.

RIGGING SHIPS ALMOST A LOST ART

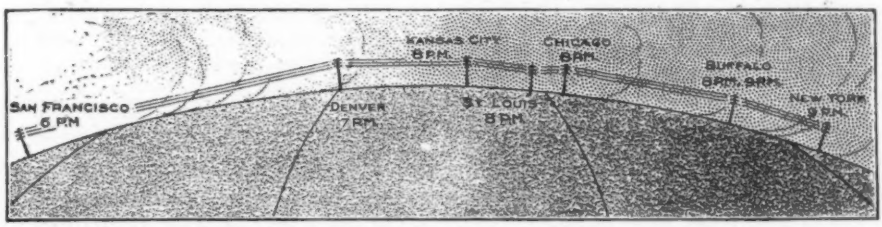
Since the advent of the steamship, the business of building sailing vessels has gradually declined to such an extent that it is difficult to secure the services of an experienced rigger when one is needed. A call, sent out recently for a sailor to rig the model of a whaling ship, revealed the fact that it was practically impossible to find a seaman who understood the art of rigging vessels sufficiently well in all its details to do the work required.



One of the Laundry Cars Constructed for the Russian Government Railways

GREAT POWER-TRANSMISSION SYSTEM A POSSIBILITY

The linking up of the electric power stations of the large cities of the country so that these stations can help each other supply energy during the periods of the maximum demand upon each, is an economic transmission development that may be expected in the future. Such a development, if carried to its fullest possibilities, would comprise a network of energy-transmission lines covering the country just as the railroads do today, making it possible to take advantage of the differences in time of different cities. New York, Philadelphia and Boston, for instance, might be connected up with Buffalo, Cleveland, Detroit, St. Louis, Chicago, and so on, across the country. The period in which the demand for power is greatest in one of these cities will differ from that of some other one, and, with the stations interconnected, they could help each other meet the maximum demand, energy being transmitted from one section to another, as needs required. The growth of such a system would begin with the doing away of the village and small-city generating plants in favor of the substations of big systems, these will tend to approach one another, and there will come a period or era of cooperation, resulting in all the systems being connected into a network of lines.



How Cities will, in the Future, Help Each Other with Electric Power, as Differences in Time and Daylight Make the Heaviest Demand in the East at Earlier Hours Than in the West

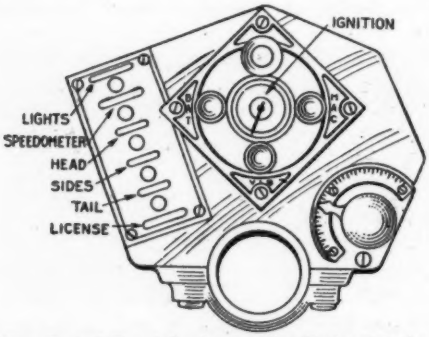
Such a system, at least, is what experts believe will come out of the endeavor to more fully utilize the diversity factor, or, in other words, to make the demand for power during every part of the 24-hour day come nearer to a steady amount. The cost of producing electric energy depends to a large extent on the load factor. The station must be such as is required by maximum demand, but the income depends upon the average demand. As an example of the diversity to be obtained by connecting the transmission systems of different cities, there is an hour's difference in the standard time in the areas to the east and to the west of Buffalo. The "peak" or maximum loads of the two areas, therefore, are not likely to coincide, making possible a decided economy in the first cost of a station serving both areas, as compared with a station supplying two areas with coinciding periods of maximum demand.

Were practically all the power demands of the United States met by a unified system of generation and distribution, there would be, according to C. P. Steinmetz, a much better load curve on the whole system than on the most modern stations at the present time.

AUTO CONTROLS FIXED TO STEERING COLUMN

An automobile manufacturer has devised a small shield which is mounted on the steering column just under the wheel and which contains all the control mechanism usually placed on the dashboard: switches for the lights, magneto, electric signals, battery, and an auxiliary air adjustment for the carburetor. All of these devices are

plainly marked so that a mistake in their operation is impossible. The various wires and rods from the control

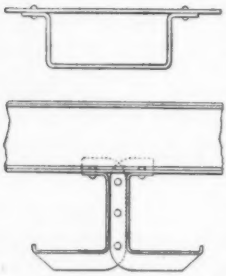


New Control Board for Automobiles Designed to be Attached to the Steering Column Just beneath the Wheel

board are run below the flooring to the various parts of the car, the section from the board to the floor being incased in a brass tube. The board itself is made of bronze and is clamped tightly to the steering column.

NEW SILL STEP FOR FREIGHT CARS

The U-strap now in use on all American railroads as a sill step for freight cars has several drawbacks from the viewpoint of safety, and the new type of step here shown is one of the attempts being made to provide a safer foothold. With the U-strap the trainman who has to mount a car while the train is in motion always faces the danger of "kicking in" too soon or too late, either of which may mean that his foot, striking outside the completely inclosed step and finding no support, cannot be drawn back and kicked into the metal strap in time to save him from injury.



The new "safety" step is of an open type, giving easy access to the foot from three sides instead of one. In descending from the car, the trainman has only to let his foot touch either side of the central supporting shaft to know that the tread is beneath. With the U-strap the danger of the foot striking the outside instead of the inside, with the subsequent lowering of it in the belief that the tread is underneath, is always present.

NEARING THE LIMIT OF AEROPLANE SPEEDS

Experience with the problem of aeroplane propellers is responsible for the growing opinion that a speed of 170 to possibly 200 miles an hour is the limit for air flight at the present outlook. In order to push an aeroplane forward a certain distance, the propeller blade tips must travel around at least twice that distance, and the limit of speed is fixed by the fact that propellers apparently cannot be made strong enough to revolve safely beyond a certain fairly well established rate.

The principles involved are comparatively simple. A propeller 10 ft. in diameter may be taken to illustrate the point. The tips of these blades will travel in a circle which has a circumference of 31.416 ft. But the pitch of the blade must also be taken into consideration in finding how far the blade tips travel in one revolution. This pitch may be taken at 15 ft. in this case, or one and a half times the length of the propeller, which is considered to be about the practical limit. With such a pitch it will be found that the blade tips, in this case, travel 34.5 ft. in each revolution.

But an aeroplane could not be made to travel 34.5 ft. forward while the blades traveled 34.5 ft. around, as the air "slips" along the propeller blades. However, it has been estimated, that by providing the right pitch, the aeroplane may be made to move forward half as fast as the propeller blade tips travel around.

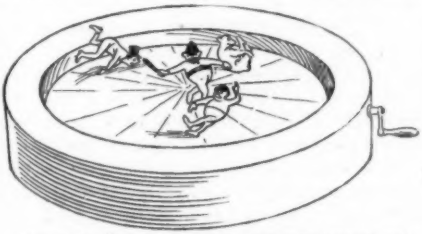
Propeller blades cannot be made of

present materials which will safely travel more than 30,000 ft. around, in a minute. Even at this speed, the centrifugal pull at the blade tip, or the tendency to fly apart, is 1,750 lb., which indicates why poorly constructed propeller blades sometimes burst to pieces.

With a propeller speed of 30,000 ft. a minute, and only half of it turned into a forward movement of the aeroplane, it is clear that 15,000 ft. per minute would be the speed limit of the craft, or 170 miles an hour. Refinements of blade construction may increase these figures somewhat, so that the limit of 170 to 200 miles is estimated.

VORTEX WHEEL A PLEASING ENGLISH TOY

English children have been having a good time with the vortex wheel, and it is now one of the toy novelties of the year for American children. The toy comprises a wheel, which is revolved within a circular frame by means of a little crank handle, and a



One of the "Funniest" Toys Recently Introduced to American Children

number of loose-jointed toy figures, representing men, women, policemen, bears, etc., which, when placed on the revolving wheel, perform ludicrous antics similar to those of people who venture upon one of the "human roulette" wheels of an amusement park.

¶In modern sawmills a large mirror is placed at the log end of the carriage to show the sawyer the back of the log, as well as the end next to him, so he can judge the exact position in which to place the log in order to cut it up with least waste.

SWIVEL SEATS ON SIGHT-SEEING CAR

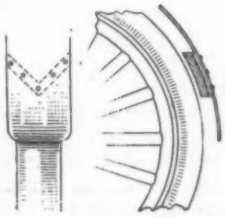
The sight-seeing cars used on the electric railway of Butte, Mont., have a seating arrangement somewhat un-

A Sight-Seeing Electric Car Having Two Swivel Chairs to a Side

usual. The chair seats are mounted in the same manner as those of a parlor car: that is, they are supported by a stationary stock and may be turned in any direction. Unlike the parlor-car chair arrangement, however, this sight-seeing car has two chairs to a side.

MUD PLOW FOR MOTOR-CYCLES

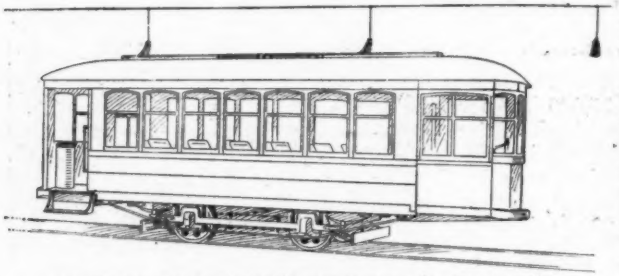
A mud plow attached to the under side of the mud-guard is suggested for motor-cycles used in localities where there is much clay or mud. The plow comprises two pieces of metal forming an



acute angle and projecting within half an inch of the tire. The mud, coming against the angle, is thrown clear, permitting the wheel to turn freely.

TROLLEY "TAILS" IN PLACE OF TROLLEY POLES

A current-feeding idea for electric railways, dispensing with the trolley pole, has been worked out by an employe of the city railway company of Des Moines, Iowa. Mounted upon, and running the entire length of the roof of an electric car, is a rail, and suspended at intervals from the trolley wire are brushlike tails, which, brushing along the rail, provide the car with current. The tails or brushes, which are 3 ft. long, are set sufficiently close together to allow two of them always to sweep the rail, thus assuring a continuous contact.



An Electric Car Receiving Current from an Overhead Trolley through Hanging Brushes

This system would permit insulation of the trolley wire itself, which would protect it from frost and ice, and also do away with much of the danger to people in the streets should it fall. Likewise, there would be no trolley pole to be jumping off.

WHY SOME MEATS SPOIL QUICKLY

The flesh of animals killed in a state of fatigue or excitement is apt to spoil more rapidly than it otherwise would, according to J. T. Milton, an authority on shipping meat in refrigerating steamers. It is supposed that the presence of one of these conditions in the body of an animal before slaughtering tends to set free certain harmful acids which, through chemical action, cause the flesh to spoil rapidly after death has ensued.

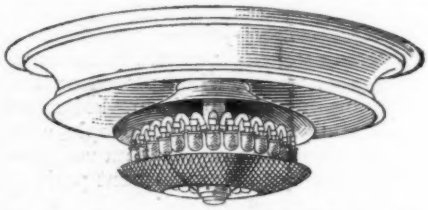
MOTOR CREMATORIES FOR ARMIES IN FIELD

Automobile crematories to follow the army in actual warfare are proposed by a German military surgeon, Doctor Blau. It is a novel solution of the serious problem of disposal of corpses, which undoubtedly will engage the attention of hygienists in future wars.

Doctor Blau states that, in 1870, German police officials found over 30,000 corpses insufficiently covered with earth in the neighborhood of Metz, which city had sustained a long siege in the Franco-Prussian war, and that, as a consequence, the wells were polluted and the mortality increased in an alarming degree. The method of incinerating the corpses on the battle field was employed by the Japanese in Manchuria.

GAS LAMPS THAT AID IN VENTILATION

An interesting form of gas lamp for theaters, halls, pavilions, and the like, producing an upward draft of air useful for ventilation purposes, is being marketed. The lamp, designed to be attached to the ceiling, comprises a ring of inverted incandescent-mantle burners which are stated to give a total light of 1,200 candlepower.



Gas Lamp Giving a Total Light of 1,200 Candlepower, and Also Effective as a Ventilator

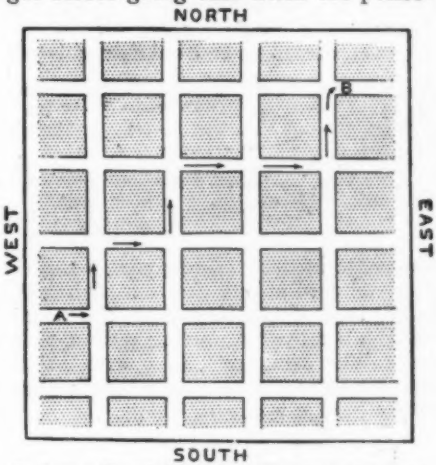
Since this type of lamp was installed in an amusement pavilion, the audience

has been allowed to smoke, a privilege formerly not allowed because the smoke collected and obscured the view of the stage.

"TACKING" THROUGH CITY STREETS TO SAVE TIME

The crossing-policeman system of regulating traffic, in which vehicles moving in one street must halt for a minute or two to allow the vehicles using the cross street to have an uninterrupted passage, need not block a pedestrian unless his destination is a point directly up or down the street he happens to be on when he reaches the traffic-controlled district. If, for instance, he enters the traffic-controlled district at or near the southwest corner of the district and his destination is anywhere near in direct line with the northeast corner, his problem of avoiding being held up at crossings by the traffic is simple. He "tacks," to use a nautical expression, and, indeed, his movements are very similar to those of a sailboat "beating to windward;" that is, sailing to reach a buoy at the exact point from which the wind is blowing.

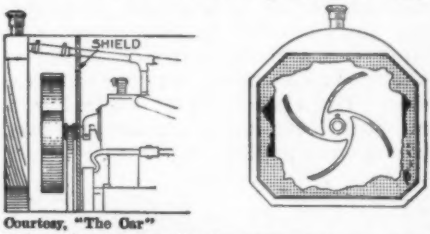
The process of "tacking" through the traffic-controlled district may be best explained by referring to the diagram. It is assumed, for purpose of illustration, that the pedestrian is at the location marked A and wishes to reach B, and that A is near the southwest corner of the traffic-controlled district. He goes down the street in the direction of the arrow until he reaches the first crossing. If the way east is blocked at this crossing he turns north, thus avoiding the blockade, and continues north to the next crossing, where he finds one street or the other blocked. Again he chooses the unobstructed crossing, and so on until his destination is reached. It may not be possible to avoid every blockade in this manner, but a far greater proportion of them, at least, than would be possible if he went straight north as far as he had to go and then east, or straight east and then north. It is quite often possible to navigate the same crossing intersection in both directions, as one may just get across going east when the policeman's whistle blows, clearing the way for pedestrians moving north and south.



To Cross a Crowded City Diagonally, a Zigzag Route, Based on Traffic Directions at Each Corner, is the Quickest

CENTRIFUGAL FAN TO KEEP DUST FROM AUTO ENGINE

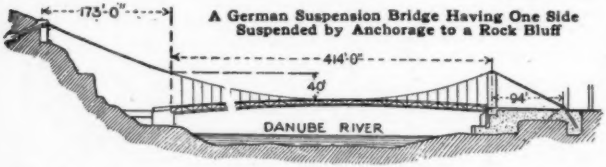
Among minor improvements recommended for incorporation in the 1913 automobile models is one to prevent dust from reaching the engine. An automobile magazine suggests the fitting of a shield behind the radiator, and the employing of a fan of the centrifugal instead of the ordinary type, so that the air and dust that pass over the tubes of the radiator will be thrown out at the sides of the bonnet, instead of being driven past the engine.



Courtesy, "The Car"
A Centrifugal Cooling-Fan Arrangement to Keep Dust from the Automobile Engine

ROCK BLUFF AS SUSPENSION-BRIDGE TOWER

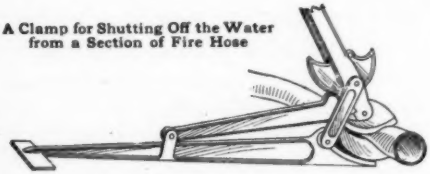
A new suspension bridge across the Danube River near Passau, a Bavarian city on the frontier of Austria, is remarkable in that the suspension cables are anchored at one end to a high rock bluff, thus dispensing with the usual tower over the supporting pier at that end. The other end, of course, is of the usual construction. The clear span of the bridge is 410 ft.



A German Suspension Bridge Having One Side Suspended by Anchorage to a Rock Bluff

SHUT-OFF CLAMP FOR FIRE HOSE

A clamp by which the water may be shut off from any portion of the fire hose to allow the removal of a damaged section; to lighten a section of hose being carried up a ladder; for changing the nozzles required for different kinds of work, and the like, without having to lose time in notifying the engineer to shut down and start the fire-engine pump again, is shown in the accompanying illustration. The clamp can be applied in a moment, locks itself in place, and may be left unattended.


A Clamp for Shutting Off the Water from a Section of Fire Hose

¶Over 1,300 serious boiler explosions occur every year in the United States, killing about 500 people, injuring between 700 and 800 more, and destroying property worth more than a million dollars.

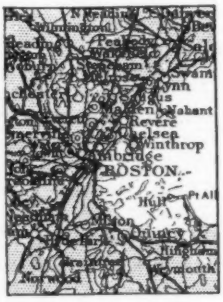
TEACHING CHILDREN TO AVOID AUTO DANGERS

The American Museum of Safety, an organization whose purpose is to develop ways and means of "conserving" human life, has undertaken the task of teaching children to avoid the danger of being run down in the street by automobiles and other traffic. How to break the small boy of the habit of playing in the streets, particularly where there seems to be no other space of sufficient size for his purposes, is a problem the solution of which is difficult, if not impossible, but the effort has already met with considerable success.

Lectures are being given with a view not only to keep children off the streets, but to teach them how to avoid accident when crossing streets. The lectures, which are free, and open alike to adults and children, are given in the New York schools, and, so far, have been attended by upward of 4,000 children. Diagrams, chalk drawings, and lantern slides illustrate the lessons.

FIRST ONE TO ONE MILLION WORLD-MAP SHEET

On the scale of one to 1,000,000, the first United States sheet of the long-promised world map has just been issued. Each country that entered the international agreement is at work on its own share of the 1,500 sheets that will be issued. Every one of the 1,500 maps will be on this same scale, and will have the same symbols. Not only have existing maps been confusing because of inaccuracies, and unsatisfactory because of varying



scales, but the jumble of signs and marks to indicate altitudes, railroads, cities, and so forth, has been growing more complex every year.

The part just issued is called the Boston sheet, and includes Rhode Island, and portions of New York, Connecticut, Massachusetts, New Hampshire, Maine, and Nova Scotia. All this is shown on a sheet 24 by 25 in., the scale being one inch to almost 16 miles.

A remarkable amount of detail is shown in accordance with the international agreement. A small portion around Boston is given full size in the accompanying illustration, indicating the amount of information on the map.

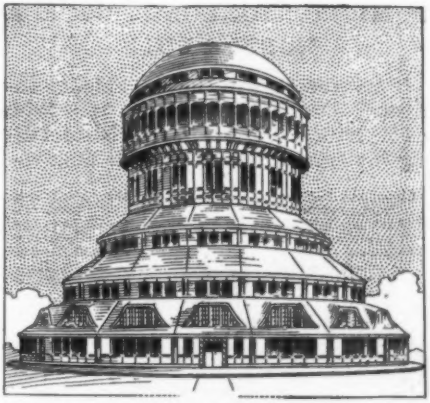
The principal cities and towns, railroads, main wagon roads, and other works of man, and the rivers, lakes and other water features are shown. The different depths of the ocean are denoted by contour lines, or "depth curves," and various shades of blue; the altitudes of all parts of the land surface, by contour lines and colors from pale green to brown.

The United States portion will be about 16 ft. in width, a very large wall map. At the present rate of progress, the United States portion of the international map should be finished within eight or ten years. It will be by far the best map of the country in existence. There is, in fact, no very accurate map of the United States as a whole, although the government publishes base maps about 7 ft. in width.

PECULIAR WATER TOWER OF GERMAN CITY

After having been used last year as an exposition building in Posen, Prussia, the structure shown in the accompanying sketch was converted into a water tower. Its base has a diameter of 198 ft. and it rises to a height of 165 ft. It is constructed of iron and many-colored brick, which are laid to form various patterns between the iron framework.

Standing, as it does, opposite the city hall with its old-fashioned clock tower, dating back many centuries, it forms a striking contrast to the medieval architecture of the latter.



City Water Tower Made from an Exposition Building

REGULATING DROPPER FOR CHLOROFORM

A simple but effective regulating dropper for ether or chloroform is here shown. It has a double tube, providing an inlet for air and an outlet for the anesthetic. A needle valve is so placed in the latter that it is easily screwed down to any degree of frequency of drops or opened to a full large stream by slightly turning the threaded valve stem one way or the other.

¶The nine members of the Canadian mounted police stationed near Fort Churchill, in Keewatin Territory, on the west shore of Hudson Bay, saw not a single white man but themselves during their entire three years' service at that post.

PUMPING THE LUNGS WITH A RUBBER BULB

Two members of the Rockefeller Institute, Drs. S. J. Meltzer and John Auer, have devised an artificial-breathing instrument, much simpler than the

pulmotor, by means of which a person may be kept alive for hours without any motion or effort at breathing on his part.

This is accomplished by pumping a steady stream of air into the lungs by means of a rubber tube pushed down into the windpipe to the point where it branches out to the lungs, having attached to it a rubber bulb or foot bellows for pumping the air. That is the apparatus in its simplest form. Of course, it has been improved and amplified until it may be a complicated machine, with a pressure gauge, a motor pump, gas bags or tanks, etc., but even the simplest apparatus will perform wonders. One of its least elaborate forms is shown in the illustration.

It consists of a rubber tube, which should not be more than one-half or two-thirds the size of the inside of the windpipe, so that the returning stream of air may escape along its sides. The tube is connected with a double rubber bulb such as sometimes seen on an ordinary atomizer for throwing a steady stream of spray or air. These are the essentials of the apparatus, but in order to know how strong a stream of air is being sent into the lungs the air tube is also connected with a gauge to show the pressure of the air passing through the tube.

The instrument may be used for reviving persons who are asphyxiated from inhaling gas, either in mines or houses, or from drowning; and for reviving new-born babies who do not breathe, or patients who stop breathing while taking an anesthetic, such as chloroform or ether. It may also be used to give an anesthetic, and it has been found to be one of the safest and best methods of doing this. In this instance, the air, as it passes from the pump to the lungs, is made to pass through a bottle containing the anesthetic, some of the vapor of which is mixed with the air and is carried to the lungs.

The method is also exceedingly valuable in operations on the chest or lungs, in which the chest must be opened. When this cavity is opened to the outside air under ordinary conditions, the lungs collapse and the patients die immediately. Such operations have heretofore been done in a large cabinet under diminished air pressure, as was described in Popular Mechanics a short time ago. By the method now described any degree of pressure may be maintained inside the lungs by simply increasing or diminishing the amount of air sent into the lungs, as indicated on the pressure gauge, and the lungs may be maintained in any degree of inflation or collapse.

In the case of asphyxiated persons, if the heart has not stopped for too long a time, the application of stimulants, electricity, massage, etc., to excite it to action, together with this method of supplying oxygen to the blood, may save many lives which would otherwise be lost. The method is called intratracheal insufflation, which means simply, the forcing of air into the trachea or windpipe.

¶For the protection of smokers, the Cuban government has enacted a law requiring each box of cigars and other manufactured tobacco to be sealed with an official stamp so that the contents cannot be removed without breaking the seal.

KANSAS SUFFRAGETTES BURN THEIR BONNETS

A "bonnet bonfire" was the means chosen by the suffragettes of Crawford county, Kan., to celebrate the granting of the right to vote to the women of that state. The demonstration was in Pittsburg, which is the county seat, and after a meeting in the courthouse the women, each carrying a bonnet, marched to the public square, ignited the bonfire, and threw the bonnets into it. Then they joined hands and marched around the conflagration.

LATEST CENSUS OF THE STARS

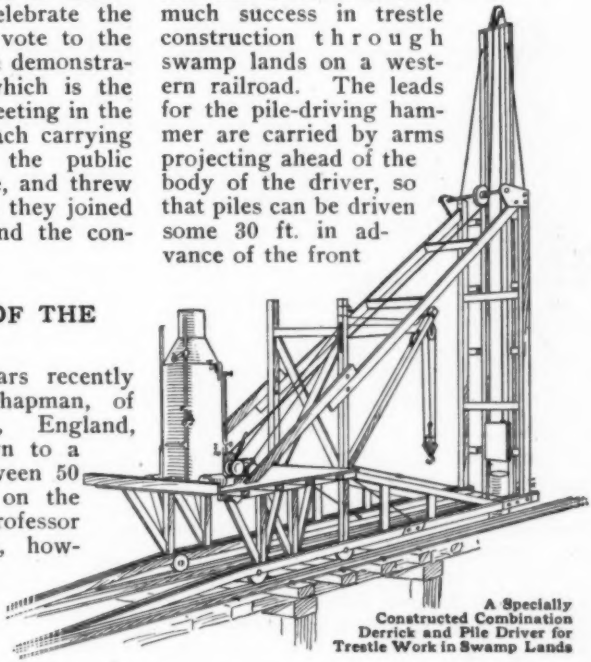
The census of the stars recently compiled by Dr. S. Chapman, of Greenwich Observatory, England, places the number, down to a magnitude of 17, as between 50 and 60 millions, which, on the whole, agrees with Professor Pickering's census, who, however, had only counted down to a magnitude of 13.5. Doctor Chapman based his estimate on photographic magnitudes, grouping his stars as to distance from the Milky Way. A star of the first magnitude is 100 times as bright as one of the fifth magnitude.

THREE-MILE PIPE CARRIES HYDROGEN TO BALLOONS

A chemical plant in Germany, yielding as a by-product much hydrogen gas, of which formerly only a small part could be sold to advantage, recently installed a 3-mile pipe line to Frankfort on the Main, where Germany maintains a dirigible "harbor," and now disposes of all this gas to the government. The daily output of hydrogen amounts to about 40,000 cu. ft. and this is conveyed under pressure to a reservoir of six times that capacity, from which the balloons and dirigibles are filled.

COMBINED DERRICK AND PILE DRIVER

A combination pile driver and derrick has been used with much success in trestle construction through swamp lands on a western railroad. The leads for the pile-driving hammer are carried by arms projecting ahead of the body of the driver, so that piles can be driven some 30 ft. in advance of the front wheels. The derrick boom is between the leads and the front end of the driver platform. An engine with three drums operates the pile-driving hammer, the derrick boom, and the derrick hoisting line, the other movements of the derrick being accomplished by hand.

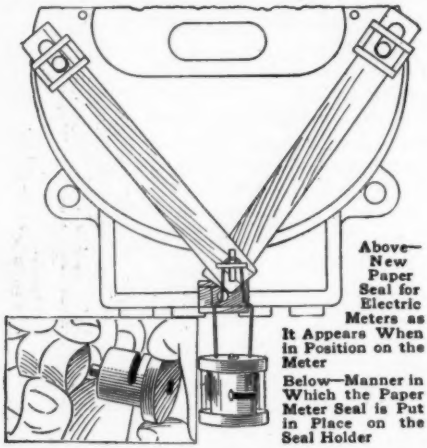


A Specially Constructed Combination Derrick and Pile Driver for Trestle Work in Swamp Lands

PAPER TUBE USED TO SEAL ELECTRIC METERS

Electric-light and power companies are considerably annoyed by people who persist in tampering with the meters installed in houses and places of business for the purpose of measuring the current. Several attempts have been made to invent a seal that would show whether or not an attempt had been made to alter the meter to defraud the company, but most of these

have been failures. A new bid for sealing efficiency has been made by a Boston concern which has placed on the market a seal having a paper tube



Above—New Paper Seal for Electric Meters as It Appears When in Position on the Meter

Below—Manner in Which the Paper Meter Seal is Put in Place on the Seal Holder

that exposes any attempt to open the meter. The tube is treated with a waterproofing compound to insure its durability under the damp conditions that sometimes prevail in places where meters are set up. It is slipped over a metal seal holder and inclosed in a glass cylinder to which is snapped the locking cap. The seal wire passes through the paper, and it is impossible to break it without tearing the paper and thus destroying the seal. As each seal is marked with an identifying number, there is no way in which the meter can be successfully opened without making the fact plain to the first inspector who examines the meter.

SMELTING IRON BY RITES AND INCANTATIONS

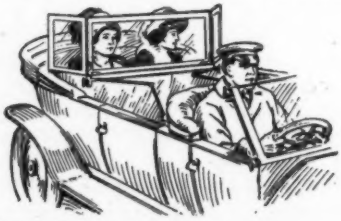
Very primitive methods of reducing iron ores are employed by the natives of Sudan. The smelters, who are also very skilled blacksmiths and form a separate caste of high standing, dispose the ore and charcoal in alternate layers in a forge similar to the so-called Catalan furnace, and the draft is supplied from ordinary bellows worked by natives. The reduction process takes from two to eight days and the iron produced is very pure, malleable, and adapted for various uses. Ordinarily it is members of one family who attend the furnace, the foremanship being intrusted to an old man, well versed in the magic formulas and incantations that insure good results; for it is to these, rather than to their own work, that the natives ascribe the success of the smelting operation.

SERVING ROAST BEEF AT A PROFIT

A 40-lb. cut of beef, cooked and served recently at a hotel, yielded the following result: 24 orders of roast beef at 60 cents an order, $14.40; three orders of short ribs at 45 cents, $1.35; four orders of hash at 50 cents, $2.00, and four sandwiches at 35 cents, $1.40, a total of $19.15. As the meat cost $10.80, the gross profit was $8.35. After deducting 42 per cent for overhead charges, a net profit of 31 cents was realized. If the entire cut of beef had been allowed to "set" for one hour before slicing, about three more orders of roast beef could have been served, increasing the profit to $2.11.

WINDSHIELDS FOR THE REAR SEATS

Windshields for the special protection of persons riding in the rear seats of automobiles are meeting with considerable favor. The shield is mounted on extension arms attached to the back of the front seat, and may be folded



Windshield for the Protection of Occupants of Rear Seat

away out of sight when its service is not required. The shield has side wings which may be set at any angle.

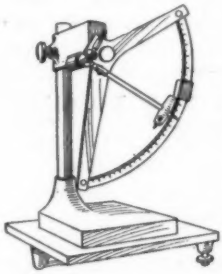
PRESERVING FISH IN CARBONIC GAS

Carbonic-acid gas outfits for the preserving of fish have been placed upon the English market. In this process the fish are placed in an airtight receptacle, a tube of liquid carbonic gas is connected up, and the gas is admitted under a pressure of 75 to 90 lb.

It is claimed that the fish may be preserved perfectly fresh by this process for a period of at least six months, and that, when taken from the receptacle, they will remain in good condition for a time 25 per cent longer than if preserved in the usual manner.

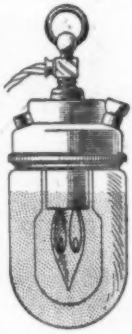
HAMMER FOR TESTING HARDNESS OF STEEL

A machine designed for testing the hardness of steel, said to be practical for approximations, is shown in the accompanying drawing. The specimen to be tested is held tightly in a vise, and is struck a blow by a little hammer. This hammer swings like a pendulum, and the height of the rebound after striking measures the hardness of the specimen subjected to the blow.



FLUID COLOR COAT FOR DARK-ROOM LAMPS

Dark-room lamps giving the necessary red or other colored light by means of colored fluids surrounding the electric globes have recently been devised. The advantages claimed over ordinary dark-room lamps are that the color or shade of color can readily be varied, and that the liquid absorbs the heat rays of the lamp. In this device, it is not necessary to take the lamp apart to change the fluid, for openings to the fluid tank, with screw stoppers, are provided in the top of the apparatus.



POLAR EXPEDITION TO KEEP "IN TOUCH" BY WIRELESS

The wireless telegraph is expected to play an important part in the North Pole expedition of Captain Amundsen, for the Spitzbergen wireless station, which is only about 1,000 miles distant from the Pole, has a range of 1,200 miles during the night. The expedition is equipped with a wireless outfit of sufficient capacity, it is believed, to make communication possible, at least occasionally, during the long polar night.

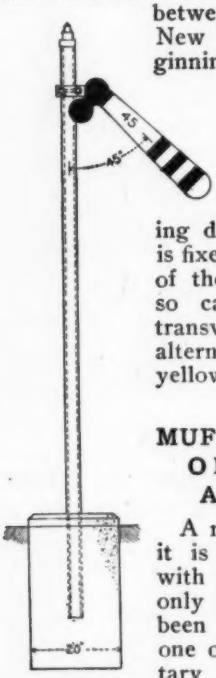
COMBINED WINDOW SIGN AND REFLECTOR

A sign, intended to do away with the ordinary painted signs on shop windows, and at the same time provide illumination for the window, is shown in the accompanying drawing. The letters, which are brilliantly lighted by lamps, may be changed easily, thus making it possible to display any kind of reading matter. The lamps illuminate the window display, the light being diffused downward by the sides and back of the box, which is lined with glass.

Illuminating the Sign and the Window Display with One Set of Lamps

SPEED-LIMIT POSTS ON EASTERN RAILROAD

Speed-limit posts have been set up on the main line of an eastern railroad between Pittsburgh and New York. At the beginning of each curve that has a speed limit of 45 miles or less there will be a post of the type shown in the accompanying drawing. The arm is fixed at 45 deg., and is of the "coon-tail" type, so called because the transverse stripes are alternately black and yellow.



MUFFLERS TESTED ON FRENCH AEROPLANES

A muffler which may, it is claimed, be used with a loss of power of only two per cent, has been recently tested on one of the French military aeroplanes with considerable success. The tests took place before a military commission, and it is said that during the flight the noise of the motor was so much reduced as to allow the pilot of the machine to speak to persons on the ground while flying at a height of 300 ft.

STEEL AND RUBBER COMBINED IN AUTO TIRE

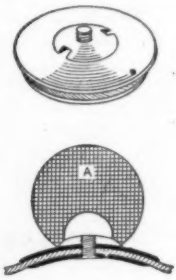
One of the newest types of automobile tires have treads imbedded with a number of parallel strips of spirally woven steel fabric running around the circumference. The effect is some 90,000 upstanding spirals of steel wire interlaced with the rubber. The combining of steel and rubber in such a way is expected to secure increased durability and produce a tread which is proof against surface cuts and punctures. It is also claimed that the steel spirals assist the escape of heat from the tires and thus tend to keep down their temperature.

GLASS WHICH WITHSTANDS SUDDEN COOLING

A remarkable new kind of glass has just been introduced by the great Jena glassworks of Germany, for water gauges on steam boilers. Glass now used will stand a pressure of 3,000 lb. per square inch or more when it is cold, but if it is hot and cold water happens to strike it, breakage occurs at a pressure of about 100 lb. The new glass, which is called "durobax," will, under the same conditions, when struck by a jet of cold water, stand a pressure of 450 lb. per square inch. The experiments which gave these results were made at a temperature of 482 degrees Fahrenheit.

QUICK REPAIR FOR RUBBER BOOTS

Small holes in a rubber boot are quickly repaired and made water-tight by means of the little device here shown. It consists of two plates, both of which are concave. The inner plate has a threaded pivot which is pushed through the hole in the boot and projects through a hole in the outer plate. The two plates are then forced tightly together by screwing a flush nut onto the pivot, a special key, A, being provided for this purpose.



¶Among the new ideas in house construction is the combination of a living room, conservatory and sun parlor, which is finding much favor with the fortunate home builders who can afford to indulge in such a trinity of luxuries.

THE WONDERS OF LIGHT

By J. GORDON OGDEN, Ph. D.

Chapter XI — The Glory of the Firmament

WHEN the day is done, and the pearly gray of the twilight glow blends softly into somber darkness, one by one appear the spangled, flashing glories of the night sky. Near at hand glimmers the mystic sheen of the northern lights. Farther out glitters the cold, silvery light of the frozen moon. Still farther out in the night the planets, wheeling in their orbs, send their light messages through space. From age-old journeyings come the keen shafts of starlight. From even greater depths and profounder abysses of space comes the exquisite radiance of suns and stars and shining nebulæ—so far away that only a soft glow, just the embers of sunlight, remains.

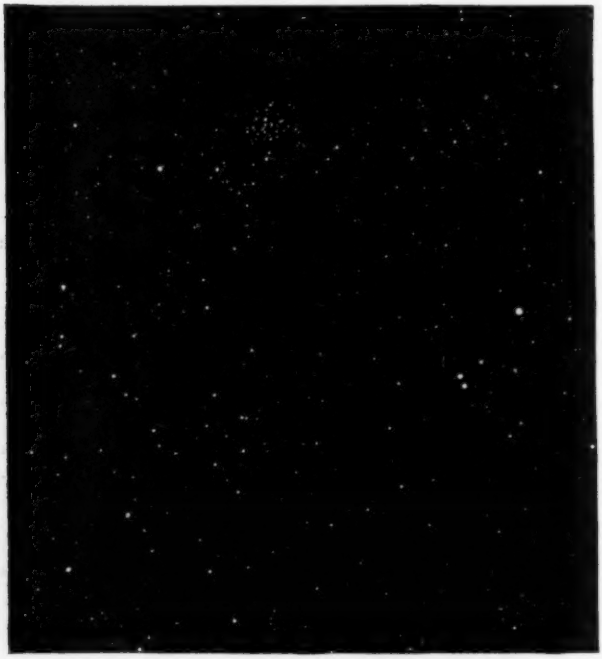
Wistfully the sad-eyed northerner, dulled with ages of cheerless cold, gazes at the shimmering scintillations of the aurora borealis, and dreamily ponders whether the wondrous refulgence is indeed the fairy bridge across which some day his soul shall pass from the drear, stern life amid eternal snows to the ineffable happiness of the after-life, as foretold in the runes of his myth-loving forefathers.

Wonderful, indeed, are the northern lights. The beautiful tints of amethyst and lilac, of beaten gold and shining silver, of richest crimson edged with purest azure, that make up this most wonderful of all nature's handiwork, can never be adequately described. One might as well attempt to convey to the deaf the delicate harmony of a Chopin waltz, or the graceful, sprightly melody of a Mendelssohn's song without words.

In trailing clouds of glory that sweep across the shadowy skies, the aurora writes its harmony only for those who are fortunate enough to see it. Mayhap in the twinkling of an eye the colors are gone, fading into the dull gray of nothingness, and then, instantly an arch, far-flung, of indescribable beauty quivers into the sudden glory of pulsating life, and then changes, as suddenly as the harmony of a song, into brilliant streamers of chromatic loveliness that span the heavens from the far horizon to the

zenith. Then a wondrous curtain, glowing with all the prismatic colors, descends from out the darkling night, and through its mystic, lacelike folds may be seen the clear, bright light of the eternal stars, like jewels adorning wonderful robes of lustrous silk, far rarer than any that ever came from India's famous looms.

Like lightning, thunder, comets, "shooting stars," and all other natural phenomena, the aurora was deemed to be of supernatural origin, and many were the omens and portents that were attributed to the beautiful display of the northern lights, by the ignorant and superstitious. The untutored minds saw not the beauty of this marvelous glory of the heavens, but were awed and appalled by its weird unfolding, and its shrouded warning of things that were to be. Then slowly came science with its delicate, magnetic needles, its telescopes, and its spectroscopes, and the myths and shadows of the dreamy northerner were forever shattered and dispelled.



Photograph of the Hyades Region—"The Stars in Front of Our Eyes are Legion"

Auroras may be divided into two general classes: those that do not affect the magnetic needle and those that do. The first class usually appears in the form of an arch. The second class forms long streamers, and occasionally presents the appearance of curtains hanging in the sky. As these curtains rise from the northern horizon, they deflect the compass in an easterly direction, but after they have passed the zenith, the needle veers to the west. This is in itself a very significant fact and proves the connection between the auroras and terrestrial magnetism.

It is quite likely that the auroras of the first class are of a phosphorescent nature, while the second class may be due to small particles charged with negative electricity. It is quite probable that the sun is emitting an infinite number of small, corpuscular bodies charged with negative electricity, quite similar to the negative particles known as the Beta-rays emitted from radium. It has been suggested that these negative particles are drawn toward the earth's magnetic poles, and are concentrated there. This would produce a higher potential of these charge-bearing particles, and a consequent luminescence, due to electrical discharge. This would reasonably account for the fact that the auroral displays are practically limited to the polar regions.

Oftentimes one is impressed with the awful loneliness and blackness of space as revealed by the night sky. Apparently only a few stars here and

there, some bright, some dim; and in between and beyond lies the bewildering abyss of infinite space and infinite darkness. In some portions of the heavens, singularly free from stars, we look into, but not through, black lanes of night stretching away into nothingness. Nevertheless, every cubic inch of this tremendous, soul-dazzling universe of ours is filled with the delicate, tremulous pulsations known as light waves. From æon to æon these quiverings have passed from world to world, from star to star, from galaxy to galaxy. So far as we know, they are without beginning and without end. Light that does not enter the eye is, of course, invisible. Hence, the blackness of a sky that is really filled with light—light that passes us by in its journey through space.

When we gaze up into the starry sky we see, if the conditions are favorable and our eyesight good, about 3,000 stars. Really the number of the stars in front of our eyes is legion, but the light from them is so faint that we are unable to distinguish them. The sensitive plate of the photographer, however, easily remedies our shortcoming in this respect. The silver emulsion receives the light waves that are invisible to us and a cumulative effect is produced, building up the image of a star that never can be seen by the human eye, even when aided by the highest powers of the telescope. An ordinary camera, with an ordinary sensitive plate exposed for an hour or two on a starlit night will reveal beautiful "star trails," each star, with fingers of light reaching out of the blackness of night, tracing its shining archway on the plate.

The Trifid Nebula, Photographed with a 2-Ft. Reflector

The light waves that fill the universe are not the least of the wonders of the firmament. They are made up of long waves, intermediate waves, and short waves, and are therefore of every color imaginable. In number per second they mount up into the trillions. Were a person to stand on the ocean beach and count the number of water waves that break upon the strand, it would be found that about six seconds of time are required for each wave—about 10 per minute. Now, since light travels 186,330 miles per second, and each wave of red light has a length of 1/33,000 of an inch, it follows that when the ruddy beams from the star Antares enter our eyes, a shaft of light, 186,330 miles in length, composed of nearly four hundred trillions of waves, piles into the retina in a single second! Suppose that we could slow down the tremendous velocity of these red waves until they traveled with exactly the same velocity as the water waves before referred to, viz., six seconds for each and every wave, it would require 76,000,000 years to do what is ordi-

narily done in one second! Rather a long wait just to catch a glimpse of red light!

The tremendous, mind-staggering distances between even the nearest of our celestial neighbors have been a favorite theme with those who like to juggle with multitudes of figures, or to make erudite speculations as to the nature and extent of the universe. No one can comprehend what a hundred miles into space are, not to mention a thousand, a million, or a billion. And yet we must have some standard, some unit of measurement, for the estimation of these distances, enormous as they are. The unit generally used in comparing star distances is known as the "light year," being the space covered by a light wave, traveling 186,330 miles per second, during the period of one year. If you have the spare time, reader, calculate for yourself the distance in miles. Incomprehensible as is this unit of measurement, nevertheless our nearest star neighbor, the brightest star in the constellation of the Centaur, is just four of these units distant from our earth. In other words it would take us four long years to reach the Centaur, were we to travel on the wings of light, every second of that time speeding 186,330 miles outward into space.

Possibly a better appreciation of the tremendous distance between our earth and the nearest star may be gained by a few illustrations. A pound of the very finest silk thread, woven from the filmiest portion of the cocoon, will reach, say, completely around the earth at the equator—a girdle of silk 25,000 miles in circumference, and weighing exactly one pound. Suppose that we wish to run a single strand of this silk to Alpha of the Centaur. How much silk would be required? No less than 500,000 tons! Suppose we had the power to dwindle the heavenly bodies and their respective distances from each other to such an extent that the sun and earth, now separated by a chasm 93,000,000 miles across, would be just as far apart as the distance between the two eyes in the human face. How far from the earth, on this same reduced scale, would be the nearest "fixed" star? Just 11¼ miles!

Not the least of the wonders of light is the truth that, through its agency, ordinary deeds and ordinary happenings, as well as all other kinds of affairs in this busy world of ours, are immortalized. We are accustomed to the idea that souls are immortal, that energy cannot be annihilated, that matter cannot be destroyed, but what of this extraordinary immortality of deeds? Simply this: light that is reflected or given off from an object carries an image, a picture of the object, with it on its travels, no matter how long the journey or whither it may tend. When these image-carrying light waves enter the eye, the picture they bear is revealed, whether the waves have been only the infinitesimal fraction of a second in coming from the face of a friend across the street, or whether they have reached the eye after a jaunt of 100,000 years through space, from the flashing scintillations of a far-off star. Even as we see our nearest star neighbor not as it is today, but as it was four years ago, the light that is reflected to this star from our planet carries pictures of the earth as it was 48 months ago, and any person, if at that distance from the earth and equipped with some means of collecting the light waves, would see events and deeds that had transpired on this earth in the year 1908!

Suppose we had such an apparatus and could out-travel light. We could journey to the Pole star, 60 light years from the earth, and behold! we would see the earth as it was in the year 1852! If we journeyed nine years of light waves farther in toward the earth, we would intercept the light pictures showing the firing on Fort Sumter in 1861. Even though every book and every manuscript, and every monument should be destroyed, the gallant charge of Longstreet, and the incomparable bravery of our northern and southern soldiers, are written eternally on the scroll of the heavens. Long after the earth with its pomp and vanities has crumbled to cosmic dust, or vanished

into some other system, the light waves flashing eternally through space will continue to carry the comparatively brief story of man and his deeds.

If we traveled still farther out into space, and caught up with the light waves that left us, say 420 years ago, we would see Columbus discovering America! The waves that left us about 700 years since would give us the picture of Runnymede, with John, surnamed Lackland, signing the Magna Charta. Nearly 2,000 light years from the earth speed the waves that bear the story of Caesar's fame and the glory that was Rome's. Still farther out, hurtling through the eternity of unending space, is a picture from far back in the dusty corridors of time, a picture of the earth when it was void and without form, ages and ages before that wonderful creature, man, had entered the arena of life.

The wealth of color that adorns the firmament is one of the greatest wonders of light. Our own sun, sending forth white light that is easily splintered into the primal colors, is responsible in equal measure for the chromatic harmonies of a sunrise and the gorgeous hues of an autumnal landscape. Were our sun to give forth only yellow light, gone forever would be the emerald of the spring woods, the turquoise of a summer sky, and the sapphire of a tropical sea. The ruby and the opal would lose their blazing fire, and become ordinary untinted stones. The flush on the cheek of youth would fade to a murky yellow, and the pure flesh tints would be lost in an unpleasing sallowness. The same colors with which we are familiar on earth are to be found everywhere throughout the endless realms of space. The red of Antares and Arcturus is the same red that burns in the rose. The blue of the great star Vega is the blue of the forget-me-not. The yellow of Capella is the yellow of the buttercup.

Undoubtedly, in the profundity of the universe there are millions of worlds like ours, circling around a sun or suns. The telescope with its magical accessories has revealed to us the presence of many double stars, the smaller of which, for some unknown reason, has generally a higher color in the spec-

"Star Trails," Obtained with Long Exposure, "Each Star Tracing Its Shining Archway on the Plate"

trum than the larger. And there are triple stars, and even quadruple stars. What must be the inconceivable glory of a sunrise on a planet belonging to a system of four suns of different colors, one white, one emerald green, one lilac, and one garnet! What combinations of hues, what divine blendings of tints, to delight the esthetic souls of the favored inhabitants of those chosen spheres, far away in the silvery twilight of the Milky Way!

After all, these wonders of light are naught but broken chords in a harmony beyond our senses. Some day, depending upon the wonderful work of science, may we not hope for a fuller and better appreciation of the simple, underlying nature-truths, now so dimly perceived? May we not in some later life beyond the stars come to a knowledge of the wondrous melodies which at present only thrill us with their sweet, elusive hauntings?

(Conclusion.)

¶A remarkable speed of a little more than 100 miles an hour up an incline was recently made in a French hill climb, the car accomplishing this feat being a 200-hp. Benz. The time portion of the hill was exactly one kilometer (3,280 ft.), and the record-breaking car traversed it in 22 seconds, which gives an average speed of 101½ miles an hour.

MARVELOUS ANCIENT ARCH NEAR BAGDAD

A marvelous arch still stands in the desert about 40 miles south of Bagdad, on the east bank of the winding Tigris River. It is part of the crumbling summer palace of the ancient Parthian kings, only a portion of the façade and the great vaulted arch, 96 ft. in height, remaining standing.

A Marvelous Ancient Arch of Asia

The country for miles around is an empty desert, and the traveler ascending the Tigris sees the arch looming up in the distance, somewhat resembling the hangar of a huge airship.

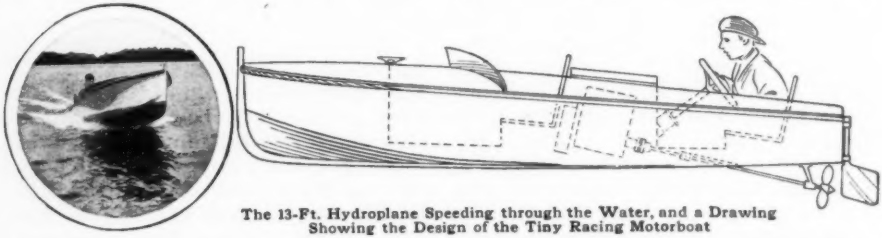
¶The American legation at Pekin is now provided with a wireless equipment operated by marines. In the event of future Chinese disturbances, the legation will not be handicapped in dealing with the situation by lack of communication with the Asiatic fleet, as was the case during the Boxer uprising.

STORAGE BATTERIES DOING DOUBLE WORK

How to make the storage batteries of electric vehicles do double duty is a problem that has been solved by a certain manufacturer. The old plates, instead of being sold to the junk dealer, are put into glass battery jars in the factory and "burned up;" that is, the connections are made by fusing the lead straps of the plates together in the usual way and the batteries connected to the factory main wire. These batteries are then recharged while the plant is running during the day, and the current so stored is used at night for electric lighting and running elevator motors. The old plates, in their new position, may be used for about 18 months and effect a considerable saving in electric light and power bills.

"BUMBLE BEE" IS SMALLEST HYDROPLANE

One of the smallest fully equipped hydroplanes ever turned out is the "Bumble Bee," a little 13-ft. craft constructed at Bath, Maine. The hull is of V-bottom construction, and the greatest width of the craft is 3 ft. 9 in. The power plant consists of a little 2-cylinder engine capable of developing 6 hp., which is sufficient to drive the "Bumble Bee" at a good speed. The

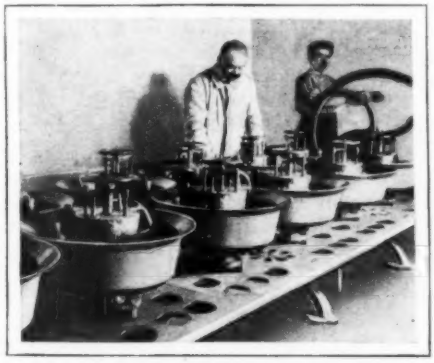


The 13-Ft. Hydroplane Speeding through the Water, and a Drawing Showing the Design of the Tiny Racing Motorboat

boat has an auto-control steerer of polished brass and mahogany with the regulation controls.

BAKERS JOIN TO OPERATE LABORATORY

Nearly all the bakers of Paris are members of a syndicate which has its headquarters in a well-equipped building in the center of the city, and here are installed laboratories for analyzing flour which any of the members may send in. Another very useful test consists in actually making up the flours into loaves so as to see which are the best ones to be used. There is installed a set of 12 mechanical kneaders of small size, and a certain weight of flour from each sample is made up into dough in an identical way. After leaving the kneading machine, all the batches are baked in a common oven. This gives a good test of the quality by taking the weight of the loaves and observing their whiteness, etc. Adulterations of the flour are detected at the same time by chemical analysis. Bakers find this a great aid in selecting flour.



Laboratory for Analyzing Flour, Conducted by Parisian Bakers

¶Sixteen different kinds of elm are grown in the world and five of this number belong to the United States. They are the rock or hickory elm, slippery or red elm, cedar elm, winged elm, and the white or American elm.

CAT-TAILS USED FOR MATS ON HOTBEDS

Are cat-tails of any use? Some kinds are; for instance, the ones shown in the accompanying picture. They are cut from the Calumet and other swamps, near Chicago, woven into mats and used to spread over hotbed sash by the hundreds, by truckmen who raise their own vegetable plants.

Mats of Cat-Tails, Ready to be Unrolled as Covers for Hotbeds

STERILIZING WATER BY HEAT

A small water-sterilizing device for use in hospitals, schools, households, etc., which produces sterilization by the heating of the water under pressure to a temperature of only 207 deg. F. without causing boiling, has been put on the market. The device consists of a round tank, inclosing at its lower end a coil and topped by a small boiler which can be heated by an alcohol or gas burner. The water to be sterilized enters at the bottom of the tank or cylinder and rises around the coil to the boiler, where it is heated to a temperature of 207 deg. F. It then rises over a tube at the top of the boiler and descends through a cooling coil to the bottom of the cylinder, from which it rises again through an outside tube to the discharge pipe. The apparatus, which produces from 100 to 125 gal. of sterilized water per hour, requires but a very small amount of fuel for operation.

A TOURING AUTOMOBILE FOR HORSES

Automobiles constructed especially for the transportation of horses are not particularly new but the vehicle here shown has several unusual features. It is a complete traveling camp as well as a double-box stall on wheels, and also carries a miniature knockdown barn, which is set up during race meetings. It likewise carries feed for the horses and food for the men, and a mattress and spring bed for the trainer.

Special Automobile for Transporting Race Horses from One County Fair to Another

The purpose of the outfit is to transport the two horses of a Buffalo racing man from one county fair to another.

SHELL EXPLODES AFTER PIERCING ARMOR

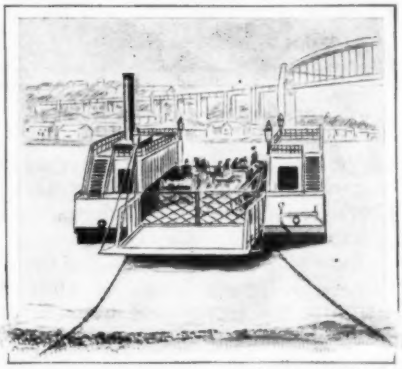
Successful tests of a new shell, which will not explode until after it has penetrated the armor of a vessel, were recently made by the French naval authorities at Cherbourg. The first shells were fired against an old vessel, provided in part with armor of regulation thickness, at a distance of 1,300 ft. and all went through its armor before exploding, causing great destruction in the interior, fragments being thrown for over half a mile around. The shells were fired at close range to insure accuracy, but a reduced powder charge was used to give the effect of firing at a long range.

FLYING WITH A FIVE-HORSEPOWER ENGINE

As a contrast to the French racing monoplanes, some of which are equipped with engines having as high as 140 hp., an airman of Washington, D. C., has made flights with a biplane fitted with a motor developing no more than between 5 and 6 hp. This power seems ridiculously small, considering that the machine is about the size of a small Wright biplane, yet it has made many straight flights. When turns are attempted, however, the tendency to settle is quite pronounced, but, as the machine is not particularly light, changes are contemplated which will give it a greater reserve power with the present power plant. The machine has a wing spread of 26 ft., and is driven by two chain-driven propellers, 5 ft. 7 in. in diameter.

FERRYBOAT PULLS SELF ACROSS RIVER

One of the most curious ferries in existence is to be found on the river Tamar in Devonshire, England. The Tamar is a tidal river and the current is so strong that the ferry must cross



Courtesy of The Car

The Chain Ferry on the River Tamar in Devonshire, England

the river on chains. Two chains are laid across the river, parallel to each other, the ends being firmly imbedded in the banks. The ferryboat is provided with a steam engine and a system of cog wheels which pick up the chains and thus pull the boat along.

NEW ELECTRIC FURNACE FOR REFINING IRON ORE

An electric furnace for converting iron ore into the highest grade of soft pig iron, at the rate of almost 20 tons a day, is being operated in California. The furnace or smelter, in which the energy of an electric current is turned into heat that melts the ore, is all contained in a steel box, 27 ft. long, 13 ft. wide and 12 ft. high. The box is lined with fire-brick clay, and the hearth, of the same material, inclines from the sides and end toward the tapping hole in the middle of the front. In drawing the molten mass from the furnace, iron containing most of the impurities passes out first; then the soft, even-grained pig iron, and finally the slag. The tapping hole is kept plugged with clay except when the molten mass is being drawn off. The roof of the furnace is built in the form of an arch and has five stacks in a row. These stacks or tubes, which extend upward from the roof a distance of 15 ft., are used for the purpose of charging the furnace, and are covered with caps when the furnace is in operation. The apparatus for furnishing the 3,000 hp. of electric energy necessary to operate the smelter is located in the rear of the furnace.

The operation of the electric furnace is entirely different from that of the ordinary blast furnace, as no sounds or other signs issue from the box, in which the very high temperature of 4,200 deg. F. is constantly maintained in order to transform the crude ore into refined iron at the rate of more than six tons every three hours. The charging is done at regular periods without shutting off the current and, while means are provided for drawing off the gases, no air is allowed to enter the furnace while it is in operation.

AEROPLANES DROP BOMBS ON MODEL DIRIGIBLE

Aeroplane maneuvers recently held on the Johannisthal aerodrome, near Berlin, included the destruction of a

Bomb-Dropping Practice on Model of Dirigible Balloon

model dirigible of the Zeppelin type, 50 ft. in diameter and 150 ft. long, made of wood and linen, and resting on the ground. The idea of the experiment was to show, in a general way, the effectiveness that might be expected of aeroplanes in destroying the dirigibles of an enemy by flying overhead and dropping bombs.

The imitation bombs used were of metal, bottlelike in shape, filled with sand, and were sufficiently heavy to pierce holes in the dirigible.

The biplanes proved more successful than the monoplanes in striking the dirigible with the bombs.

¶It is estimated that the production of automobiles in this country for the 1913 season will reach the 600,000 figure.

GIANT PROPELLER BLADES FOR BIPLANE

The propellers shown are each 10 ft. long with a pitch of 10 ft., and each blade weighs about 25 lb. They were recently completed by a Chicago manufacturer for a Californian who is constructing a biplane with a total plane surface of 1,800 sq. ft.—one of the largest aircraft of its kind in the world. The blades were cut from Oregon spruce timber.

¶Underwear of paper, especially recommended for airmen on account of its lightness and heat-retaining qualities, has been put on the market by a French manufacturer. The fabric is said to be so strong that a man cannot rip it with his hands.

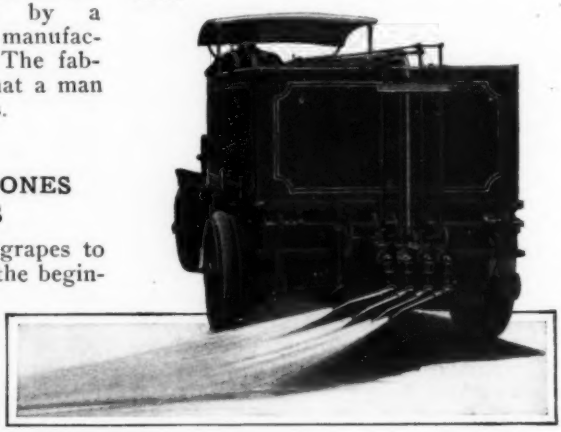
FIELD OF COBBLESTONES RIPENS GRAPES

The first crate of Tokay grapes to reach the eastern market at the beginning of the season were grown on land near Oreville, Cal., once worked over by gold dredgers. This field is covered with cobblestones plentifully mixed with river-sediment soil, and the rapid ripening of the grapes upon it is credited to the fact that the cobbles absorb a great deal of heat during the day and radiate it at night, thus giving the fruit an almost constant warmth.

The first crate of Tokay grapes shipped from California the preceding season was also produced under unusual circumstances, but in this instance the ripening was artificially hastened. A Japanese grape grower did not leave nature to put the red color on the grapes unassisted. Early in the season he selected several large bunches, enough to fill a crate or two, and arranged mirrors so that the sun would be cast upon them from morning till sunset.

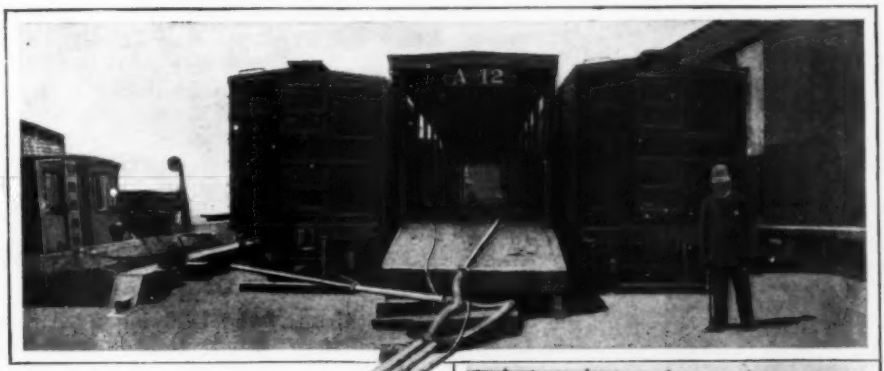
A HIGH-POWER MOTOR STREET SPRINKLER

The latest improved type of motor street sprinkler acquired by London is fitted with rotary sprinkling heads capable of sprinkling a surface 62 ft. wide, and, in addition, has powerful flushing nozzles, the particular purpose of which is to clean out gutters. In order to obtain the pressure necessary for this work, the water tank is fitted with a centrifugal pump capable of delivering water through the nozzles at a pressure of 60 lb. per square inch.



Powerful English Motor Gutter Flusher and Street Sprinkler

The tank has a capacity of 1,000 gal. of water.



Pumping Wine into the Steel Tank Cars at the Wineries

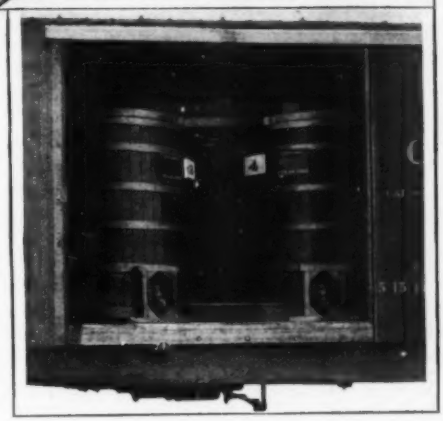
WESTERN WINES NOW CROSS AMERICA IN TANK CARS

Cars with four steel tanks having a glass lining similar to that of a porcelain bathtub are now being used in transporting wine in bulk from California to the East. The cars are boxed in over the tanks and insulated to protect the wine from being affected by changes in the weather. Each of the cylindrical tanks holds about 2,500 gal.

The shipment of wine in tank cars has proved of great advantage in handling wine in bulk, and effects a direct economy since the price of wine barrels has been steadily increasing because of the tremendous drain on oak cooperage, the United States having supplied this commodity to practically all the countries of the world for a great many years.

Cars with tanks built of redwood, each containing about 1,100 gal., have also become very popular. Six redwood tanks are screwed permanently in a box car and this enables the wineries to ship six different kinds of wine in a car at one time. It also gives the wines every advantage of aging during transportation that they would have in casks.

These tank cars have been in local use in California for some years, but it was not until lately that the railroads permitted transcontinental shipment in such manner.



Wooden Tanks Installed in Ordinary Freight Car

SOLDIERS BREAK IN SHOES BY WATER TREATMENT

A simple, although effective, way of "breaking in" shoes is that employed in the United States army. After the shoes have been fitted to their feet the soldiers stand in water up to the shoe tops, until the leather is thoroughly soaked. Then the soldiers are put on a march, and this "hike" is kept up until the shoes are thoroughly dried on the feet. Forever afterward the shoes are perfectly comfortable, for they conform in shape to every little peculiarity of the wearer's feet. This method of breaking in shoes, while not new in itself, is one result of the recent investigation of the foot trouble of the army, which the specially appointed board of army officers has been conducting.

A TWO-DOLLAR SILK GOWN

A gown, the material of which cost but $2, is shown in the accompanying illustration, the wearer being Mrs. Nina Wilcox Putnam, wife of a member of the Putnam Publishing Co., New York. The curse of civilization, according to Mrs. Putnam, is the parasitic woman, parasitic in this instance meaning extravagant with the money earned by the husband or father. She says: "The adoption of the simple, cheap and beautiful garment will give women a power and freedom that they have not had since they were the governing power in the primitive world."

Copyrighted by Underwood & Underwood, N. Y.

The gown which is shown in the illustration, was made as a demonstration of this simplicity, cheapness and beauty. The material, which is blue, brocaded raw silk, cost but $2. The width of the piece of cloth was 52 in., and all she did in making it was to double the length from neck to instep, sew up the sides, make a slit large enough for the head to go through, and hem up the edges.

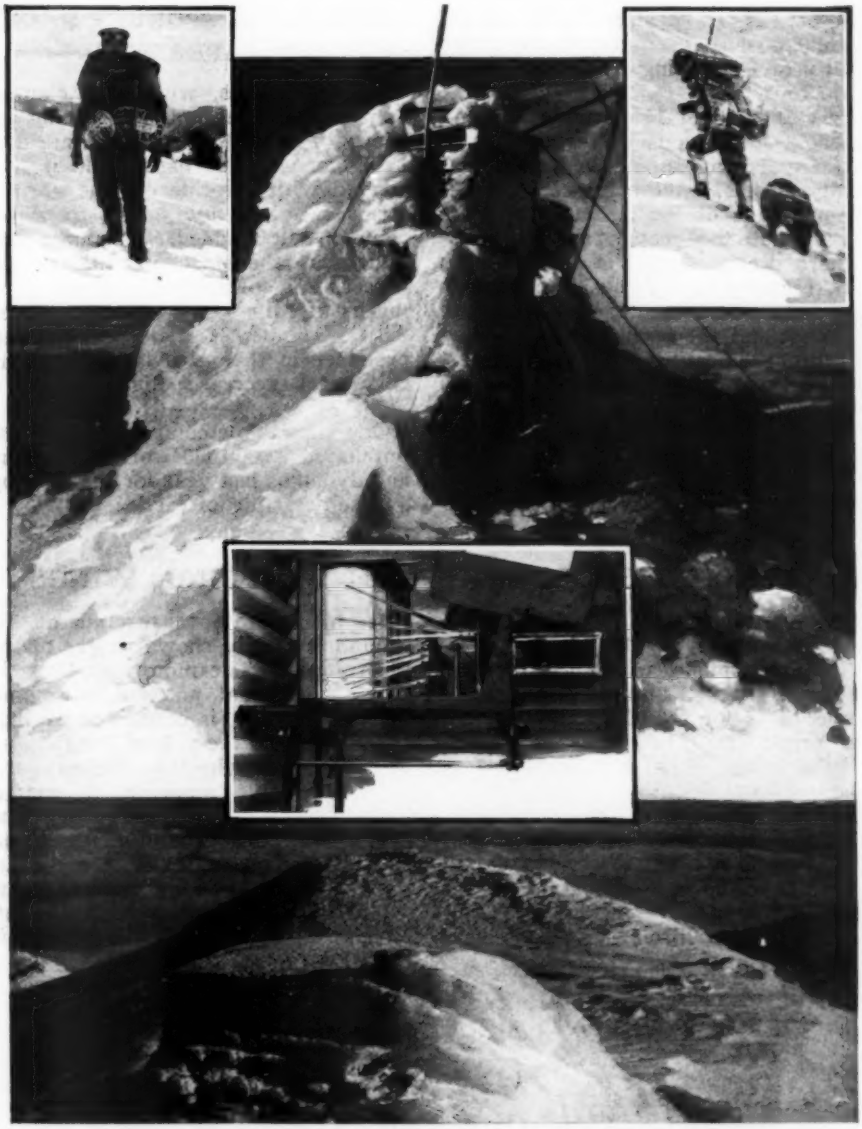
"STANDING" LANDINGS MADE WITH MONOPLANE

An airman who is flying a Bleriot monoplane has developed what is called a "standing" landing which, if it can be always executed with reasonable safety, should prove especially practical in cross-country flights. Instead of coming down in the ordinary way and running along the ground until the machine stops, this airman flattens his planes while at a considerable height above the ground, then deliberately lets the machine "pancake" for several feet ("pancaking," it is assumed, is a gradual settling down with a slight sliding-off motion), and at the last moment drops the tail so that the tail skid and wheels touch at the same moment, the result being that the machine does not run at all, but practically stays exactly where it lands. This maneuver makes landing possible in very small open places.

TRAILING THE FROST BELT IN NEVADA SNOWS

Every two months, winter and summer, a party of enthusiastic volunteer mountaineers climb through the storm and snow to the summit of Mount Rose, which rises near Lake Tahoe in Nevada to an elevation of 10,800 ft. above sea level. The desire to determine the habits of cold waves and frost action for the benefit of fruit raisers in the valleys and on the side slopes is their motive, for on the summit is a complete set of weather-recording instruments which must be read and reset every two months.

After long experimenting in winter storms, that rage on high mountains, a meteorograph with adequate housing has been perfected which will accurately record the variations of the weather on the mountain tops. Temperature, atmospheric pressure, humidity, sunshine, and the direction and velocity of the wind are all recorded on a single sheet of paper, as is also the 12 o'clock hour. The instrument will run two months without resetting, the winter attention being given by volunteers, who have learned the secret that mountain climbing is as feasible in winter as in summer, because of the continuous snow fields that cover the inequalities of the surface.



Top, at Left—Volunteer About to Start for Mountain Top to Reset Instruments. Top, Center—Instrument Shelter on Mount Rose, the Masts having been Wrecked by Accumulated Feathers of Ice and Snow. Top, at Right—Climbing the Mountain in a Storm. Central Picture—Meteorograph, Which is So Inclosed That neither Wind nor Snow can Enter Shelter, Although the Wind Sometimes Blows 100 Miles an Hour. Below—Mount Rose Observatory in Midwinter

Two base stations, similar to the summit station, have been established on either side of Mount Rose, so that a vertical triangle of stations has now been formed with a base 80 miles long and the apex approximately one mile above. By regular observations at these stations, vertical sections of pass-

ing storms can be charted. The central problem of these studies is the possibility of forecasting frost from mountain tops.

By the aid of 17 portable stations, located for periods of three years at strategic points along the valley rims and bottoms, a temperature survey is being made of the agricultural lands of the state to discover "thermal belts" where orchards can be planted with fair security from frosts. These belts are classified according to the degree of frost and the feasibility of employing orchard heating. The belts of least intensity of frost occur uniformly on the higher slopes of the valley.

This is probably the first instance of a temperature survey of a state for its fruit belts and is being conducted by the University of Nevada.

ARTIFICIAL SPONGES MADE OF PAPER PULP

Paper sponges, which are claimed to possess all the liquid-absorbing capacity of the natural product, are now being made. The paper pulp is first treated with chloride of zinc until it forms a nearly fluid mass, to which common salt is added. This mass then undergoes a compressing and drying process in a special machine, which by means of rollers and plates, provided with a number of metal projections, produces in the mass the canals and cavities of the real sponge.

¶One automobile company in the east purchased $1,000,000 worth of motors and dynamos last year for the lighting and self-starting of cars.

FRENCH MONOPLANE WITH FLAPPING WINGS

French airmen are evincing considerable interest in the new Dubois-Riout monoplane, which has flapping wings, constructed on the principle of soaring birds, and no propeller. The span of the wings is 34 ft., the weight of the machine about 800 lb., and the motor develops 35 hp. The speed expected is 84 miles an hour.

The means provided to get the novel machine off the ground is clearly shown in one of the illustrations. The motor, mounted in the usual position on monoplanes, is connected by belt to the axle of the running wheels. When the machine attains a speed along the ground sufficient to raise it into the air in an upward soaring or gliding flight, the power is

Above—Front View of Flapping-Wing Propellerless Monoplane, Showing Belt Connection between the Motor and Running-Wheels

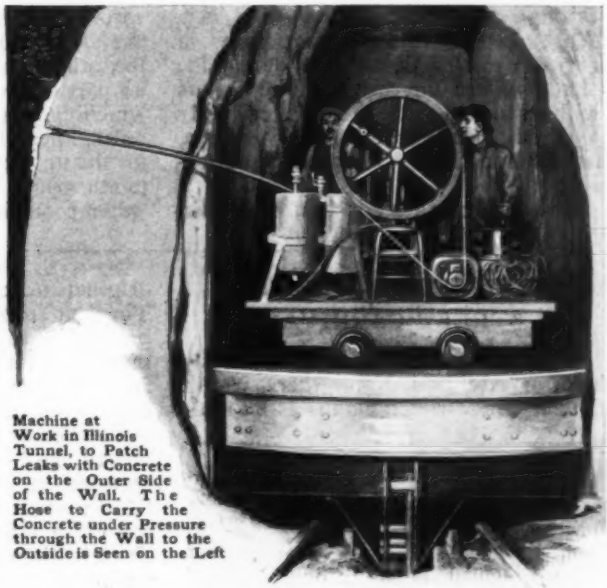
Copyrighted by M. Branger, Paris

Below—A Rear View of the Wing Flapper with Wings Raised

switched from the wheels, and used altogether for the flapping of the wing-like planes.

PATCHING THE OUTSIDE OF TUNNEL FROM INSIDE

Some six stories down, below the basements and subbasements of most of the large buildings of Chicago, resting in the slimy subsoil and treacherous sands, the bore of the Illinois tunnel under Chicago cares for an immense part of the cartage that would otherwise make the congestion of State Street a hopeless problem. Since its installation, universal transfer stations, where large and small shipments to all points are taken to be routed underground to their destination, have been established and scores of local stations receive and send out thousands of boxes and barrels daily; wares that, if hauled in the streets of the so-called down-town district, would form a continuous blockade all day long.



Machine at Work in Illinois Tunnel, to Patch Leaks with Concrete on the Outer Side of the Wall. The Hose to Carry the Concrete under Pressure through the Wall to the Outside is Seen on the Left

Weeks of below-zero weather affect the tunnel, causing more leaks than usual, and in the drifts that run under the Chicago River the pumps last year were not large enough to keep the water down. Here and there the contraction due to the unusual changes in temperature opened crevices and the water oozed through and rose above the tracks, temporarily preventing the use of one or two of the passages. Preparations are complete for handling this problem this winter.

To have patched these leaks with a trowel and grouting would have been impossible, and even a rich cement mixture thrown under pressure against the smooth, wet walls would have been useless. No effort was made to use these old-fashioned methods, however. The work of keeping the tunnel dry is in the hands of a cement expert, who, after years of experience, concluded that it was useless to depend on a chemical bond to stop the leaks, and, therefore, turned his efforts toward a mechanical method.

The only proper means, he judged, would be to put the patch on the outside of the walls, and he set about doing this. To cut a hole large enough to make the patch was quite a job and the joint formed by the new grouting and the old was not always waterproof; sometimes the leak was more serious after the remedy than it was before. Several years ago he had thought of a better way of getting the grouting behind the walls and he now rigged up an outfit suitable for putting it into practice. A pneumatic electric drill was secured and used to bore a hole through the wall where the leakage was worst. This done, he connected a series motor to the trolley and the track in the tunnel and pumped air into a small cylinder until the pressure

gauge registered about 120 lb. This cylinder was connected with another of the same size and the second connected with a hose, which was in turn thrust into the hole bored through the wall.

The repair is then made as follows: A rich grouting of cement, mixed wet, is poured into the second tank and the compressed air is admitted on top of it. The valve at the bottom is opened and the grouting is instantly forced through the hose and deposited in a dense water-tight layer that oozes in between the earth and the outer side of the wall of the tunnel. The hose is withdrawn and the hole is carefully plugged, so that when the job is done, little evidence of the patch is noticeable.

The ordinary leak is easily patched by one tank of grouting, but sometimes the water trickles down the walls for yards or drops from the ceiling over large areas. The work is then more difficult, and often many holes have to be bored before the fracture is found and the water ceases to come through.

It is true that these walls are buried far below the frost line, but during long-continued cold weather the cold will enter the tunnel through the elevators and the cars will whisk it into the drifts and carry it from one end to the other, and while the shrinkage in no part is great, yet in the long walls, which extend for a distance of several miles, there being no provision made for the unusual contraction, the weaker joints open here and there and the water soon finds its way through.

FERRIS-WHEEL FLOAT IN STREET CARNIVAL

During the corn carnival recently held in Atchison, Kan., there was a flower parade which claims as its most original feature a Ferris-wheel float. The four seats of the wheel were occupied by little girls, and the wheel was made to revolve by power derived from the turning wheels of the wagon upon which it was mounted.

The flower parade, it is claimed, was one of the largest of its kind ever attempted in this country. More than 3,000 women worked upon the features for three weeks, and the cost of the French tissue paper alone, used for making the paper flowers, was $2,100.

A Ferris Wheel, Seating Four Little Girls, and Actually Revolved, as One of the Floats of Atchison's Flower Parade

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General View of a German Exhibition of Model Aeroplanes

BERLIN HAS AEROPLANE-MODEL EXHIBITION

An interesting aerial exhibition was recently held in the Architects' League Building, in Berlin, all the craft displayed being model aeroplanes, of which there were a great number. Each machine bore a number for purpose of reference. The model aeroplanes are types of the 1912 output of German toy makers.

ORNAMENTAL LAMP FROM ORDINARY VASE

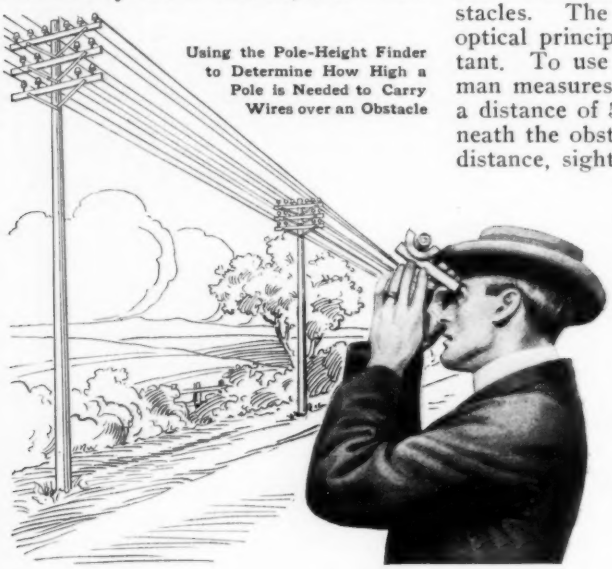
A device by means of which an electric lamp can be attached to an ornamental vase so as to make an artistic table or library lamp is shown in the sketch. The disks D are spread until they form a base of sufficient diameter to rest on top of the vase. The upper part, the top of which is adapted to receive an electric bulb or fit into a recess in the oil reservoir of the table lamp, is screwed on and the device inserted into the vase. The pivoted legs or branches B are then raised by means of a small lever actuating a vertical screw, until they lie close against the inside of the upper part of the vase, as shown.

Device to Enable the Use of an Ordinary Vase as a Base for an Ornamental Table Electric Lamp

Ornamental Table Lamp, Fitted on a Vase, Lamp being Held by Spreading Disks and Legs

DEVICE ESTIMATES POLE HEIGHTS

The line department of a western electric railway is making use of a pole-height estimator, a pocket device invented by two of its men, with which the lineman can sight over the object to be crossed and read directly on a scale the length of pole needed to give a 5-ft. clearance over trees or other obstacles. The estimator is similar in optical principle to the mariner's sextant. To use the estimator, the lineman measures with tape or by pacing a distance of 50 ft. from the point beneath the obstacle, and then from this distance, sights through the estimator tube at the tree top or obstructing line. Operating a pointer at the side tilts a level until its bubble, seen in a mirror, placed at an angle of 45 deg., appears alongside the object sighted at. After bubble and object have been sighted together in the tube, the pointer shows on the scale the exact height of the pole, allowing for clearance and setting.



Using the Pole-Height Finder to Determine How High a Pole is Needed to Carry Wires over an Obstacle

A "HUMPED"-BOTTOM MOTORBOAT

In one of the small shipyards along the north branch of the river in Chicago may be seen an old man at work on an old motorboat, the hull of which presents a series of irregular humps, which he believes are going to give it a high speed. The inventor, who is called "Professor Bumps" by the employes of the yard, works upon the boat every day, fashioning queerly shaped humps on its bottom. These, he declares, will give her great speed, as they will force the water to the keel, making a solid body of water for the propeller.

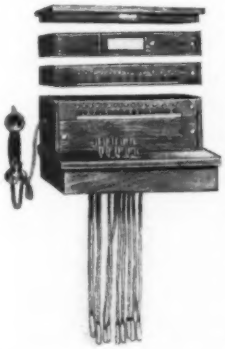
It is interesting to note, in connec-

Humps Formed on the Bottom of a Motorboat, with the Idea of Giving Speed

tion with this story, that naval engineers in Europe have taken up similar ideas. Attention is being drawn to the advantages claimed for a reversion to bulged sides, carried to the point of actual corrugation. An editorial in the London Times says it is somewhat difficult to realize in what manner such corrugations can assist the movement of water, normally, toward the after part of the vessel, so as to provide more advantageous streamlines in the region of the propeller, but insists that the question is one that should easily be put beyond doubt by experiments with models. What is really required is a determination of the relative resistances of smooth and corrugated ships at high speeds.

SECTIONAL-UNIT TELEPHONE SWITCHBOARD

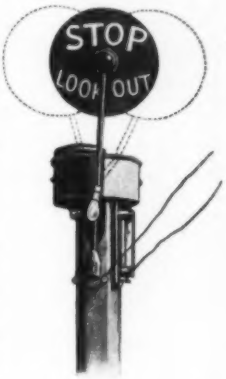
An entirely new type of telephone switchboard for private-exchange systems in offices, stores, factories, etc., is here shown.



The first unit of the board, which has been designed along lines similar to the sectional-unit idea used for filing systems and libraries, will accommodate 20 wires. When more wires are required, the capacity of the switchboard is increased by adding other units each containing 20 wires. The units fit together like those of a sectional bookcase, and by adding these units, it is possible to make a switchboard of 40, 60, 80 or 100 lines capacity. Another excellent feature of this form of switchboard is its arrangement for sounding a general alarm by means of ringing and talking to all stations at the same time, thus providing a fire-alarm or general-alarm system without additional cost.

RAILWAY-CROSSING SIGN FOR COUNTRY ROADS

A new style of automatic flagman that can be seen and heard is in use on several electric railway lines in California.



The circular disk, bearing the words of warning, is hollow and contains an electric light to illuminate the 4-in. central lenses of red glass on either side of the disk, which is supported by two pivoted arms that rock back and forth about 30 times per minute when a train is approaching. On the top of the box containing the motor which furnishes the power is a 12-in. gong that begins to ring when the motor is started by the train closing a contact on the trolley wire. These automatic flagmen have been put to severe tests, and a number of them have worked 700 times a day for three months without a single breakdown.

LUBRICATING STREET-CAR TRACKS WITH WATER

The rails of a car line in a hilly and winding street in Rome are lubricated with water, which, while not unique in itself, is interesting because of the ingenious manner in which the water is handled. At the top of the slope a stream of water is fed into the deep groove of each rail and flows downhill like a waterfall. Every 20 to 30 in. a small wooden block, reaching up to wheel-flange level, is wedged in the groove to break the flow of water.

It is claimed that the cars ride exceptionally smoothly in these water-lubricated tracks, and that the grinding noise of cars rounding curves is practically eliminated. Grease lubrication at curves is rendered unnecessary.

Street Car Leaves Track in Omaha, Demolishing a Two-Story Brick Structure

STREET CAR WRECKS BRICK BUILDING

While a heavy street car in Omaha, loaded with about 70 passengers, was running down grade and approaching a curve, the air brake refused to work and the car left the rails, plunging into a two-story brick garage and completely wrecking it. Both the upper floor and the roof of the structure fell, and three electric automobiles dropped through with the floor. None of the passengers was seriously hurt.

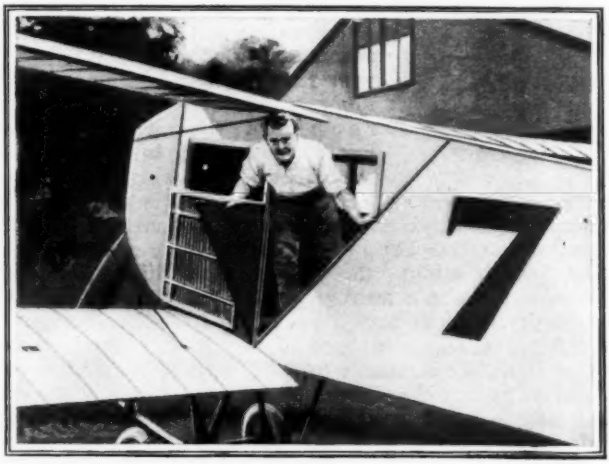
¶On a new aerodrome near Leipzig, Germany, will be erected an enormous hangar, large enough to accommodate, side by side, two dirigibles of the Zeppelin type, this being the first hangar of such size to be built.

BULLET-PROOF AEROPLANE SAVES AIRMAN'S LIFE

One of the machines which drew much attention at the recent military aeroplane competition on Salisbury Plain, England, and was finally wrecked there, is a bullet-proof Avro aeroplane. The so-called cabin, in which the pilot and one passenger ride, is armor-plated. The machine was operated by Lieutenant Parke, R. N., who is shown leaving the cabin by one of the side doors.

Although the armored cabin of the machine has never yet taken part in an actual test to prove its bullet-proofness, it saved Lieutenant Parke from serious injury, if not death, in the fall which wrecked the machine on Salisbury Plain before the meet was over. In this accident the aeroplane turned a complete somersault, and Parke was saved from injury by the stoutness of the cabin and a safety belt which held him suspended in it.

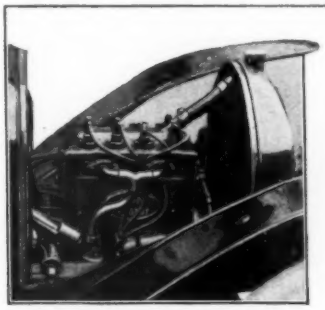
¶The Standard Oil Company is having built in Germany a motor tank-boat having a capacity of 15,000 tons. The motors will develop 38,000 hp.



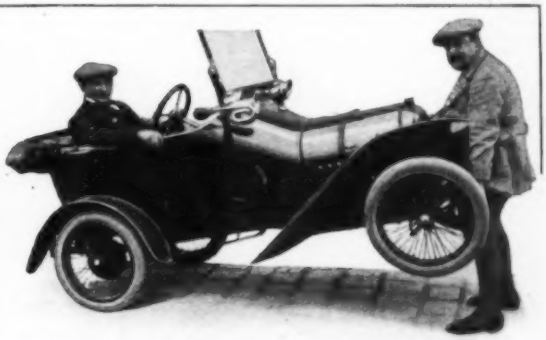
Lieutenant Parke Leaving His Bullet-Proof Aeroplane. The Machine was Wrecked in a Recent Aeroplane Competition

"BABY" AUTOS, THE NEW DEVELOPMENT

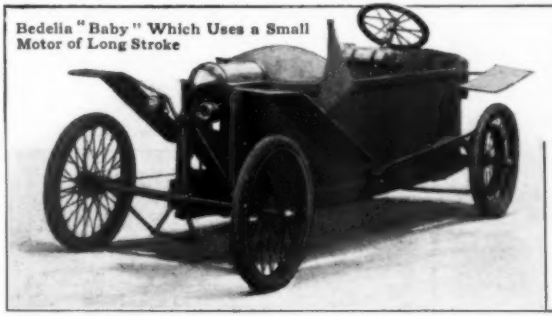
A most interesting development in the European automobile industry, as yet unparalleled in the United States, is the appearance of large numbers of small cars with exceedingly small, long-stroke motors. These cars are manufactured more or less after American methods of quantity production, but differ from the domestic small-car product in many respects, particularly in a tendency to show they have grown up from motorcycles, rather than grown down from ordinary automobiles. One of the most typical examples of the new "voiturette legère," as it is called in France, is the Lion-Peugeot "Baby." This car, which weighs only 500 lb., comfortably accommodates two people, and is propelled by a tiny four-cylinder block motor, of 2.16-in. bore by 3.5-in. stroke. Despite these Lilliputian dimensions, the rating is 25 hp. at 3,600 revolutions a minute, this exceptional figure being attained by the use of very large valve areas. The change-speed gear is of the sliding type, affording two speeds forward and the reverse, and the final drive is by worm gear. The very cheapest of the voiturettes, or "cyclecars," as the English have it, are propelled by air-cooled motors of substantially common motorcycle types.



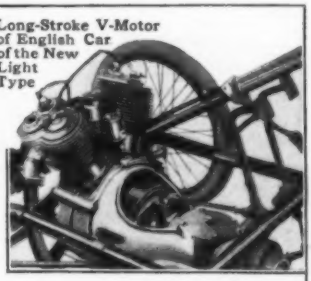
Little Four-Cylinder Motor of the Peugeot "Baby"



Demonstrating the Comparative Lightness of the Peugeot "Baby" Which Weighs Only 500 Pounds



Bedelia "Baby" Which Uses a Small Motor of Long Stroke

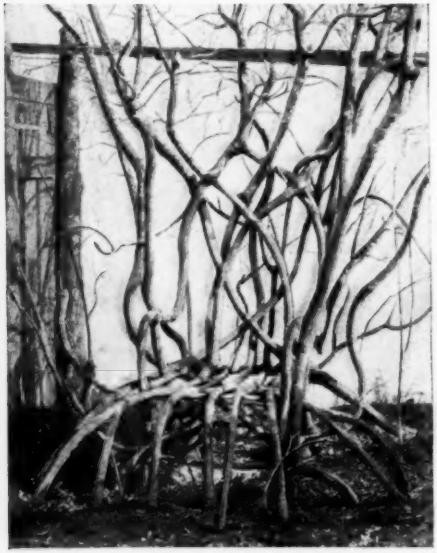


Long-Stroke V-Motor of English Car of the New Light Type

BOX-ELDER TREES FORM AN ARMCHAIR

On a farm near Embarrass, Wis., may be seen a growing armchair, formed of 28 box-elder trees. It grew just as it is shown in the illustration, being carefully trained into shape by human hands. There are now 87 joints in the chair, where the saplings

have been trained to grow together. One may recline in this tree chair with comfort. Just to keep the saplings



Twenty-Eight Box-Elder Saplings Grow into Armchair Having 87 Joints

alive and save them from all kinds of destructive worms and insects has been a considerable task, to say nothing of the work of training and helping nature in the weaving together of the elders.

ABSORPTION OF THE PLATING BY SOFT METALS

One of the peculiar features of electroplating, according to the Brass World, is the fact that soft metals, such as lead, zinc or tin, will absorb deposits of copper, silver or gold after a time, to such an extent that the plating will entirely disappear. This has not been generally understood as an electroplating fact, although it has been known in many lines for some time, particularly in coffin-hardware and soft-metal novelty trades.

It is said that the absorption of the plating may be prevented by first giving the soft metal a coating of nickel, as this metal does not seem to have the property of "soaking in" and effectually prevents the absorption of other metallic deposits. This method is used by the manufacturers of coffin hardware.

HEAVY DREDGE LIFTED OVER RAILWAY TRESTLE

In dredging an 80-ft. straight channel in the Los Angeles River near Long Beach, the big dredge, which, with all its machinery, weighs about 150 tons, came to the trestle of a double-track electric line over which a 15-minute schedule is maintained for 18 hours of the day. The railroad company refused to allow the dredging concern to do anything that would interfere with the regular schedule. After careful study of plans, the dredge was raised to the height of the trestle—a matter of about 15 ft.—by slowly jacking it up and placing cribbing underneath; a like support was built up on the other side of the trestle to receive it, and the dredge was moved across in the early morning hours, after the last night car had passed.

The Dredge, with Rollers in Position, Ready to be Moved across the Trestle

Eternal Glacier on the Slope of One of the "Three Sisters," Oregon

ICE CAVES IN AMERICAN GLACIERS

Snow is present in vast amounts the year around on the slopes of the "Three Sisters" mountain peaks in Oregon, forming glaciers of almost solid ice which slowly move down the mountain sides, diminishing in size under the heat of the summer sun, but increasing again with the heavy snows of winter.

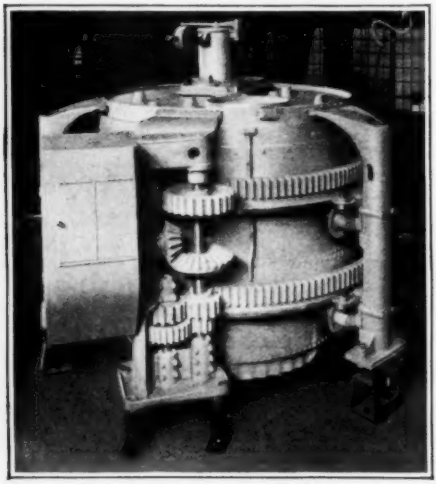
The deep crevices found in these glaciers often form caves, as is shown in the accompanying illustrations.

Near View of One of the Crevices, Which Forms a Veritable Cave

GAS PRODUCER HAS A REVOLVING FIREBOX

A new type of gas producer, the chief feature of which is the method employed to stir up the contents of the fuel bed by revolving one-half of the bed over the other, thus setting up a twisting and shearing motion throughout the entire fuel chamber, has been put in operation. The producer is divided horizontally through the hot zone into an upper and lower section, and the two sections are made to revolve in the same direction, but at different speeds. Each section of the wall carries with it that portion of the fuel bed which it surrounds, thus producing the greatest amount of agitation through the hot zone without using an agitating arm. The fuel chamber, which is stationary and has no bottom, will hold 1,000 lb. of coal, or sufficient to last for about half an hour. The lower edge of the fuel chamber is

cooled by water, and automatic devices are used to feed and spread the fuel, stir up the entire bed, and also remove the ashes. A fresh supply of



Gas-Producer Furnace in Which the Fuel is Constantly Agitated by a Revolving Fire Chamber

fuel is spread over the surface of the revolving fire bed as it comes under the fuel chamber, thus always keeping the level of the fire bed up to the bottom of the chamber, which is beveled on its lower edge for the purpose of producing a down-stroking effect upon the bed of fire as the latter passes under it.

According to the manufacturers, the rotation of the bed tends to prevent the formation of blow holes and clinkers. The first step in the process of removing the ashes is the grinding of them between the sides of the stationary air box or "ash crusher" and the revolving corrugated wall of the lower section. After the ashes have been crushed they are forced up to the top of the ash pan by three ash plows, which are kept constantly in operation and are adjusted when occasion requires. As fast as the ashes are lifted to the surface of the water in the ash pan, they are automatically scooped up and carried to the required point for automatic discharge. As a result of the joint action of the automatic fuel spreader, the twisting of the fire bed and the continuous removal of the ashes, this producer is claimed to gasify one ton of coal every hour—at least twice the capacity of the ordinary hand-operated producer, and at the same time the quality of the gas is greatly improved and more uniform.

BEACON LIGHTS FOR NIGHT AVIATION

A new method of illuminating aerodromes to facilitate safe landings at night has been recently patented. The field or landing place is provided at regular distances apart—80 to 160 ft.—with rows of lamps, located entirely underground, which give light of an intensity calculated to be plainly visible to the airman without dazzling the eye. In descending, the airman sees the whole field as a chessboard, the perspective view of which gives him a means of estimating how high above the ground he is flying.

The lamps are located in circular concrete recesses in the ground and their light is thrown upward by reflectors. Above the ground is a hood made of wire cloth covered with a transparent fabric which softens the glare of the light, this hood being collapsible, so that the wheels of an aeroplane may pass over it without damage either to the hood or to the machine. A spring is provided inside the hood to extend it again after it may have been run over.

TEARING HILLS DOWN FOR HOME BUILDERS

Not a section of a Panama Canal "cut," but a new hillside residential district in the city of Portland, Ore., is illustrated here. The rapid growth of the city has made it imperative that new home sites be found, and accordingly an enterprising firm has undertaken to terrace out the side of a mountain, to furnish building lots and streets of easy grade. The principle of hydraulic mining is employed in the work. The ground is torn out by water forced at it under great pressure, and then the earth and rock are

Like a Scene on the Panama Canal is This Section of Portland, Where Hills are being Torn Down to Provide Terraced House Lots

washed away to the river bottoms in large flumes.

The newly made lots command high prices, and are so much in demand that they are sold even while covered with forest growth, before the hydraulics have been turned on them.

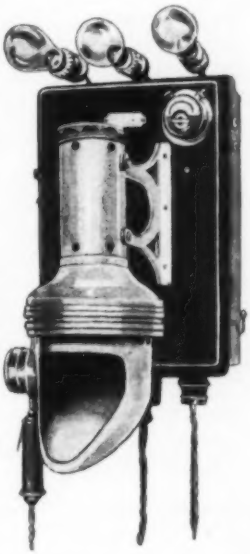
In the accompanying photograph the buildings in the right middle distance are structures left standing since the Lewis and Clarke exposition in Portland in 1905.

LARGE MEN AS MOTOR-TRUCK DRIVERS

Large, well-developed men, who can load and unload as well as drive and take good care of the machinery, are in demand as motor-truck chauffeurs. Almost without exception the business concerns who are sending men to automobile schools for training pick out big, muscular men. The wage paid to motor-truck drivers seems to be determined to a considerable extent by the capacity of the trucks. The average wage of drivers of 1-ton trucks in Chicago, for instance, is $18 per week, drivers of 3-ton trucks get from $21 to $22, and drivers of 5 to 7-ton trucks, $25 per week.

LONG-DISTANCE TELEPHONY WITH STRONG CURRENTS

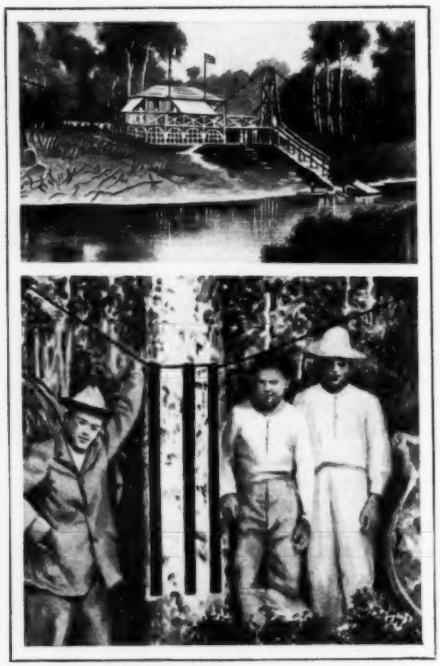
Talking into a telephone which uses strong currents of electricity makes it hot, but strong currents are needed for successful long-distance use, and so two Swedish engineers have devised a microphone transmitter that is made to keep its temper by a cooling fluid circulating through the mechanism. A fluid which will not transmit electric currents is used in order to prevent short circuiting. By means of this device conversations have been successfully carried on over a distance of



2,300 miles. The microphone is also useful for wireless work, and in this connection has been operated with as much as 200 watts. They have recently been adopted for a wire telephone line between Stockholm and Berlin, a distance of about 600 miles, of which 30 miles is submarine cable.

MILKING THOUSANDS OF RUBBER TREES AT ONCE

A machine for obtaining the sap from thousands of rubber trees at once, with less manual labor and without injury to the bark of the trees, has been invented by a civil engineer. The apparatus consists of two parts, one of which is fastened to the tree and connected by an electric wire with the other part which is placed in a central operating station. To each tree is attached 30 rubber tappers, each leading to a cup for catching the sap as it is drawn from the tree by the electrically operated mechanism. The sap, as it flows into the cups from the tappers, gradually turns into crude rubber in the form of a biscuit. The rubber tappers, each of which is provided with a device to prevent the inner bark of the trees from being injured, are so arranged upon the trees that each tapper takes the sap from a different part of the tree, in accordance with tree-tapping laws based upon many years of experience in extracting rubber milk. The apparatus, which is capable of milking more than 5,000 trees at one time, is operated to best advantage during the early morning when the sap flows more freely.



Upper View—Central Station Which Controls Tapping Apparatus on Trees

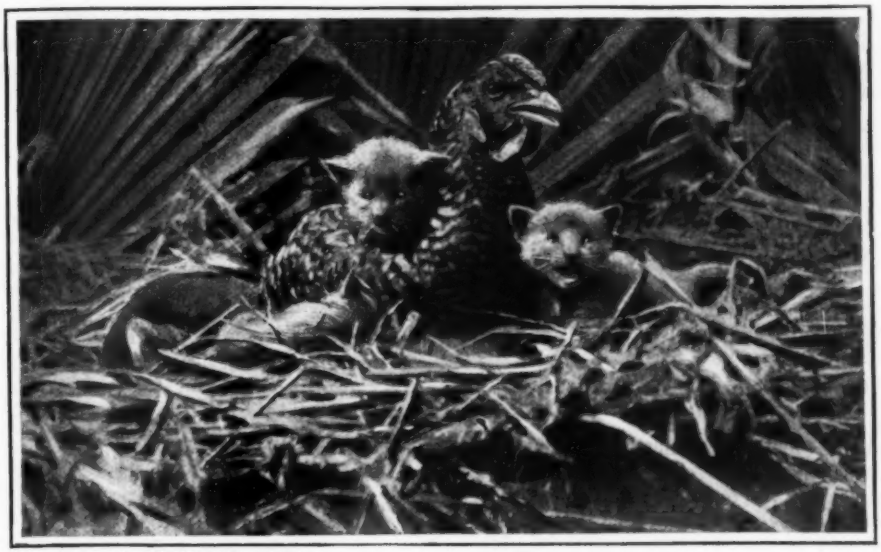
Lower View—Tapping Apparatus Adjusted to a Rubber Tree and Wired to Central Station

MOTION-PICTURE FILMS AS MACHINE DEMONSTRATORS

The motion-picture film as an agent for showing machines in action to possible purchasers in all parts of the country is a field of motion-picture activity now being rapidly developed. Large machines cannot be taken to the possible buyer for demonstration, but films showing how the machine is made, assembled, and operated, can be placed in a trunk, along with a projecting machine, and demonstrated anywhere. The kinds of machines now being sold by this method are many, including traveling cranes, derricks, dredges, brick-making machinery, marble-quarrying outfits, powder machines, water sluices, excavating machines, milling machinery, laundry machines, and the like.

HEN AS FOSTER MOTHER TO KITTENS

A hen that adopted a litter of kittens and thereby started a friendly feud with the mother cat, is shown in the accompanying illustration along with her adopted family. The kittens were born in a hen's nest on a California



Courtesy of Outdoor World and Recreation

A Hen That Brought Up a Litter of Kittens

farm, and their presence was not known to the farmer until he found the hen hovering them. They seemed to enjoy the warmth of the old hen's wings, and this caused considerable jealousy when the mother cat came to feed them. At first the cat seemed willing, however, to let the hen hover her kittens, and only concerned herself with their feeding, but once when the hen was off the nest after food, the cat enticed the kittens out of the barn, where the foster mother subsequently found them and made considerable fuss. When the kittens grew older, they followed the hen about the yard like a brood of chicks, and were even coaxed up on the roost, but the mother cat finally carried them into the house and the hen was disconsolate.

USING SIMPLE MECHANICS IN SURGERY

Besides his knowledge of medical and surgical principles, the surgeon must have some skill in practical mechanics. In his work he often applies simple mechanical principles. If one broke a prop used to hold up a clothesline or the limb of an overburdened apple tree, he would nail it or nail a cleat on it, to hold the parts together. That is precisely what the surgeon frequently does nowadays with a broken bone. One illustration shows how he pulls the bones together and drives some ordinary 8 or 10-penny wire nails, sterilized, of course, into the broken ends. If the break is such that the nails will not serve the purpose,

Ordinary Nails Used to Repair Broken Bones

Nail Repair of Leg Bones at Ankle. Safety Pin Shown is in Bandage

he opens up the seat of the fracture, accurately adjusts the broken ends of the bone and puts a metal cleat on one or both sides and fastens it with ordinary wood screws. Or he may put in

a pin just as the carpenter uses a dowel. This may be of metal, bone or ivory, the center of the bone being first drilled or hollowed out to receive it.

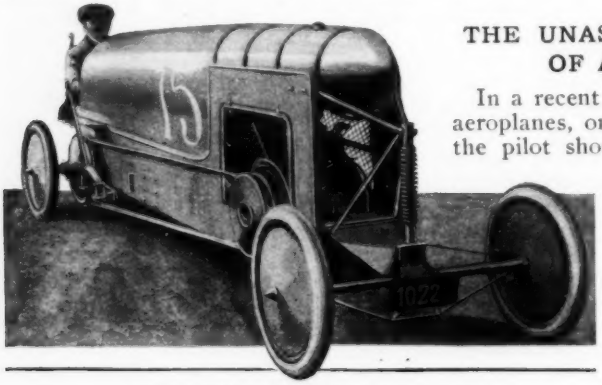
Plates Screwed onto Bone to Repair a Broken Shin Bone

Use of Plates Screwed into Bone to Repair a Bad Break

Wires are also sometimes used for the purpose. Any of these foreign materials may either be left indefinitely, or removed after union has taken place. Some of the different forms of cleats, or Lane's bone plates, as they are called, after their originator, Mr. Arbuthnot Lane, the noted English surgeon, are shown in one of the illustrations.

A UNIQUE HILL-CLIMBING AUTOMOBILE

One of the participants in a recent hill climb in Europe was the curiously constructed car shown in the accompanying illustration. The drive from the uniquely mounted engine to the rear axle is by means of a rope running over large sheave pulleys. The gasoline tank is mounted directly over the engine.



A Hill-Climbing Automobile of Novel Type

RUSSIA TO FENCE IN HER GERMAN FRONTIER

China built a great wall as a protection against the barbaric yellow hordes. Russia is to erect a barbed-wire fence, 7 ft. high, in an endeavor to stop the constant smuggling at its German frontier. The boundary between Germany and Russia is marked by a ditch, and it is on the Russian side of this that the fence will be erected. This fencing out of Germany will take five years to complete.

ALUMINUM TAGS FOR ALL MILITIAMEN

Identification tags are to be worn by all officers and men of the national guards at maneuvers and other field duties in the future, each to bear the name of the militiaman with his company, regiment and rank. War-department orders provide that the tag shall be of aluminum about the size and thickness of a half dollar, and shall be suspended about the soldier's neck by a cord.

THE UNASSISTED STARTING OF AEROPLANES

In a recent military competition for aeroplanes, one of the rules was that the pilot should be able to start his machine unassisted, but when the competition was actually held, no attempt was made to see whether or not this could be done. It was quite evident, however, that not a single machine in the competition could be started except by swinging the propeller while the machine was held back. Yet it is con-

ceded that a self-starting arrangement is of great importance, especially for military machines, and the problem should not be particularly difficult of solving, as has already been shown on several types of hydro-aeroplanes.

OLD MINE WORKING AS AIR RESERVOIR

By placing a concrete bulkhead across a drift at the 700-ft. level of a mine near Rossland, B. C., an abandoned section of this underground working has been converted into a novel compressed-air reservoir. The bulkhead is 8 ft. thick, reinforced with steel bars. Back of this bulkhead is a water chamber 35 ft. long, formed by placing a 12-in. bulkhead across the drip. The air communication between the main air line and the storage chamber is through a 6-in. pipe. Pressure gauges and valves are arranged on the outer face of the bulkhead for controlling the outflow of air. The rock in the sides of the reservoir is close-grained and free from fissures.

MACHINE MAKES, FILLS AND SEALS BOXES

A machine that automatically fills a paper bag with a brand of cooking powder, folds the top of the bag, makes a pasteboard box, places the bag and a printed circular in the box, seals the box and drops it into a large basket, is among the labor-saving devices used by a large manufacturer. The entire operation requires but a small fraction of time and 15,000 boxes are filled and sealed in a day of 10 hours. The most expert pair of human hands could not complete one box in less than three minutes, or 200 boxes in ten hours.

¶It is claimed that the candy-pulling machine, described on page 759 of the November issue of Popular Mechanics Magazine is covered by U. S. patent owned by Mr. H. L. Hildreth, of Boston, Mass., and that parties desiring to make the machine had best communicate with him before doing so.

SWAN STREET SIGN FOR SWAN AVENUE

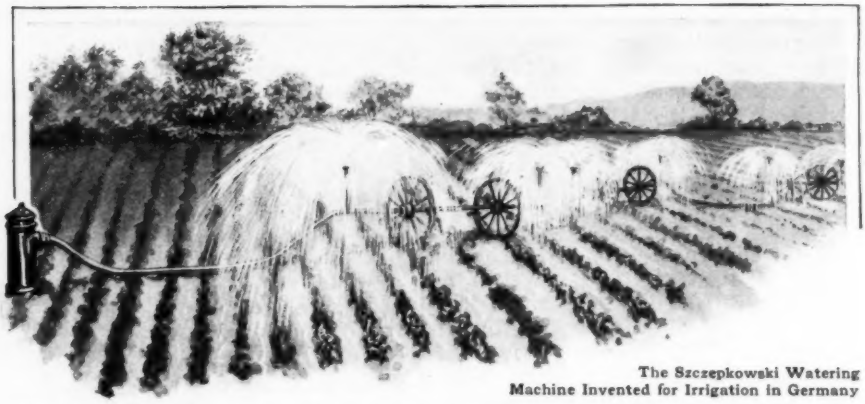
At one crossing of Swan avenue, in Ocean Park, Cal., is a swan-shaped street sign which suggests a number

A Swan-Shaped Sign Indicates the Name of the Street

of possibilities in street-sign practice. Many streets in the towns and cities of the country bear names that could be subjected to like treatment, and the person trying to find his way about would be able to tell a street at a glance while still some distance from it.

GERMAN WATERING MACHINE FOUR HUNDRED FEET LONG

The American visitor to east Germany at the present time would be greatly struck by the extremely odd-looking machines which have made their appearance in some of the fields. At first glance, they would seem to consist of a very long iron pipe bent into fanciful shapes, supported on iron wheels, and carrying 20 fountains of



The Szczepkowski Watering Machine Invented for Irrigation in Germany

water. The apparatus is really made up of 10 watering machines, joined together by 20-ft. lengths of rubber hose. Each unit consists of a horizontal iron pipe, 20 ft. long, supported on two wheels. At each end of this pipe is an upright pipe which sends a spray of water 10 ft. in every direction. Thus 10 of the units water a strip 400 ft. wide. The hose attached to the water-supply hydrant is long enough to allow the machine to be drawn over a distance of 400 ft. on one side of the hydrant, and then, by returning on the other side, over an additional width of 400 ft., so that, in all, it waters an area 800 ft. wide by 400 ft. long from one hydrant. Enough hydrants are used to cover the entire field, whatever the area. The water is pumped from rivers and lakes, or from wells by means of high-pressure centrifugal pumps.

The invention of this machine by Szczepkowski, and of others, which work more like large lawn sprinklers, was caused by the drought of 1911. The Kaiser Wilhelm Agricultural Institute took up a study of methods of irrigation, and it was concluded that the American method of running the water in furrows is too wasteful. Beside this, the ground surface in eastern Germany is too irregular.

¶A Russian woman flier, Ljuba Galantschikow, made a new altitude record for women by reaching a height of 7,800 ft.

WARSHIPS TO FIGHT FIRES IN CITIES

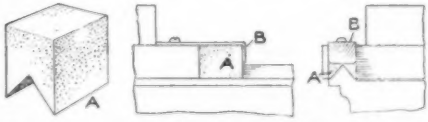
The big battleships of the United States will be used to fight fires in cities along the Atlantic coast, according to letters of inquiry received by the fire chiefs of these cities from the government relative to the sizes of hose and kinds of couplings in use by their respective fire departments. As all the warships are equipped with powerful pumps that can throw large streams of water a long distance, the government proposes to couple these pumps to the city's fire hose in case any of the vessels should happen to be in port at the time of a fire.

IDEAS FOR NEW ALPHABET WANTED BY CHINA

Suggestions for a new alphabet have been called for by the Chinese republic with the intention of adopting the one which is best. What is wanted are "signs which are simple in form, as few as possible, and adequate to express all the various sounds commonly used in the principal Chinese dialects." A conference of learned mandarins was recently called by the minister of education to work out the alphabet, but the scholars finally agreed that they could not solve the problem alone and made the recommendation for a public competition.

To Protect the Ways of a Lathe

The chips cut from metals occasionally carry with them particles of grit and sand, especially when turning cast-iron pieces in a lathe. This grit is apt to stick on the grease of the ways, and when the carriage travels over it, the metal is scored and in time the ways become worn. The neat workman, who cares for cleanliness and the appearance of his machine, can easily prevent this scratching and scoring of the lathe or planer ways by making a small attachment as shown in the sketch. The little device consists of a strip of brass, cut to fit the V-shape of the ways, bent as shown and attached to the carriage with a screw. A piece of felt, A, is fitted be-

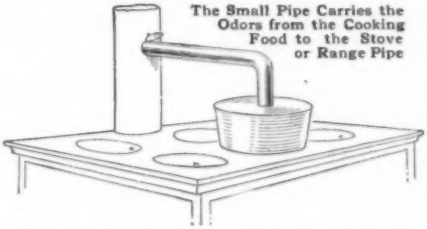


The Small Piece of Felt Picks Up All Grit and Keeps the Ways Well Oiled

tween the brass strip B and the end of the carriage. The felt is well soaked in oil before putting it in place. This will not only pick up the dirt particles, but will keep the ways well oiled.—Contributed by Chas. Kaufmann, Santa Ana, Cal.

Eliminating Cooking Odors

Cooking without odors may be accomplished in the following manner: Make an attachment for all utensil covers to convey the rising vapors from the cooking through a small pipe which enters the stove or range pipe. The pipe is removed from the cover after the cooking is completed, and a small cover, hinged to the stovepipe, is dropped over the opening. The small

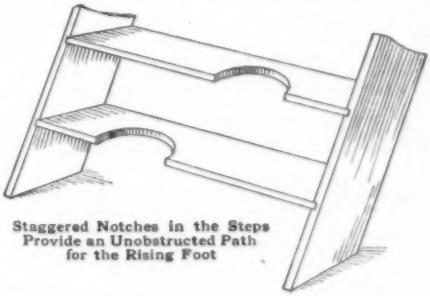


The Small Pipe Carries the Odors from the Cooking Food to the Stove or Range Pipe

pipe should fit perfectly into the hole in the utensil covers. The odors will be easily taken up the pipe and chimney along with the burned gases of the fuel.—Contributed by Julia A. White, Glenburn, Pa.

Stair Steps for a Steep Pitch

A certain building requiring a stairway had a very small place left available for that purpose; in fact, the space almost demanded a ladder. As stair steps were desirable, I used the following plan which gave an excellent



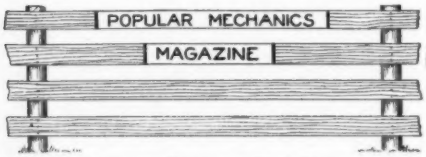
Staggered Notches in the Steps Provide an Unobstructed Path for the Rising Foot

footing on each step, yet did not interfere with lifting one foot above the other. As shown in the sketch, each

step was cut to form an opening near one end, the cut-outs being on alternate ends of successive steps. These cut-outs provided an unobstructed way for the foot to pass through as it was raised to that level. The openings in the steps were made semicircular and about 6 in. deep.—Contributed by S. B. Moore, Cleveland, O.

A Winter's Spare Time Devoted to Sign Painting

The workman in a small town finds plenty of spare time during the winter months, and I, for one, turned this



The Boards on the Fence are First Given a Coat of the White Paint, Then Lettered

time into profit by the exercise of a little ingenuity. Not having much capital but plenty of time, I spent about $3 in buying material for painting advertising signs. The outfit of brushes I purchased consisted of a 4-in. flat wall brush; two flat artists' brushes, one ½-in., the other a ¾-in., and a set of riggers. The materials purchased were 1 gal. boiled linseed oil, 2 gal. kerosene, 10 lb. whiting, 5 lb. cheap white lead, 1 lb. each green, blue, red, yellow and brown dry paints.

The white paint was mixed first, then to one-half the lead I added 5 lb. whiting, ½ gal. linseed oil and 1

ABCDEF abcdef
ABCDEF abcdef
ABCDEF abcdef

The Slanting Alphabets were Preferably Used, But a Perpendicular One is Quite Effective

gal. kerosene. This made a good white mixture that spread easily with a brush and proved to be durable and cheap, costing only about 40 cents per gallon. The other paints were mixed with the same proportion of oil and kerosene, but it was found that the red and blue would fade, and black was therefore substituted for these colors.

Orders were procured from local merchants for fence signs, the signs to be not less than 12 ft. in length, at 1 cent a lineal foot or 12 cents a sign. Contracts for over 600 signs were easily secured, and as I could paint an average of 75 signs a day at a cost of 3 cents each, a profit well worth the trouble was the result.

When this job was finished, I planned another which was to make smaller signs for those who did not care for fence signs, and these signs also proved ready sellers. I procured a roll of ready-made roofing and coated its smooth surface with the white paint, but found that it required two coats of color to cover the roofing color. The roofing was then cut into rectangular pieces, 24 by 30 in. The signs painted on these pieces were sold for 15 cents each. This did not prove to be as profitable as the fence signs, but my spare time was occupied and some money resulted from the work.

Only the two styles of slanting letters were used, but another—that shown at the top in the sketch—is also practical. They are all simple in design and easily put on the painted surface.

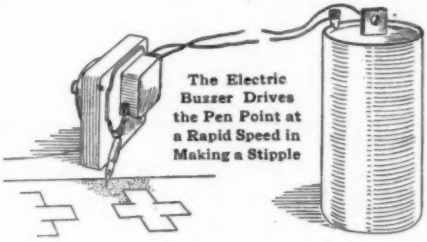
To Prevent Wing Nuts Falling from Bolts

Wing nuts are exceedingly handy devices for providing a convenient way to make attachments that are easily and quickly undone, but they are very much inclined to work themselves off the threads on account of the balancing of the wings. This is especially true where they are used to fasten the valve-mechanism covers on automobile engines. It is a simple matter, however, to keep them on the thread, even though they become loosened, by removing one of

the wings. The single wing may drop half a turn at most, by gravity, but there will be no possible way for the nut to jar itself off. The removal of one wing does not interfere with tightening or loosening the nut with the fingers.—Contributed by Stanley P. McMinn, Brooklyn, N. Y.

Stippling Drawings with an Electric Buzzer

The draftsman making a drawing where concrete sections are shown in a stipple will find the device illustrated very handy to accomplish the effect. An old bell, a push button and a common battery cell are all the requisites necessary. The gong and the lugs that hold it are removed, and the knob on the end of the hammer is replaced



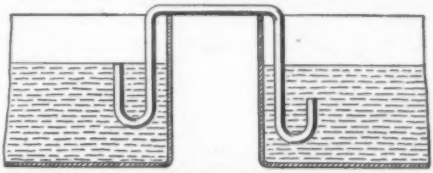
The Electric Buzzer Drives the Pen Point at a Rapid Speed in Making a Stipple

by a socket to hold a pen point. The whole is then mounted on a board with the push button conveniently mounted on the opposite side. I found it better to mount the bell box upside down, making the stroke of the magnet or armature, when released, the working stroke of the pen. This device not only saved its cost many times over, but does better work which, of course, is not so tiring to the eyes and wrist as when done by hand.—Contributed by Jacob Goldberg, Marshfield, Ore.

Automatically Operated Siphons

Having a series of glass-bottomed aquariums which must be connected, I used a self-starting and self-stopping siphon, as shown in the illustration, between the tanks. The sketch shows the shape of the siphon.

This siphon can be used in a cider mill or wine factory for connecting vats, thus saving the expense of mak-



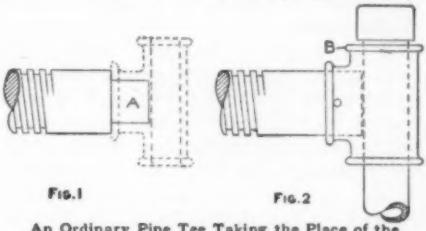
The Shape of the Siphon Makes It Self-Operating in Starting and Stopping When the Liquid Level is Changed

ing the connection through the bottoms. The farmer could use the same device for connecting a series of tubs for watering stock.—Contributed by Edward F. Bigelow, Sound Beach, Connecticut.

Handle End for a Vise Screw

While making a carpenter's bench vise, I found that the fitting which holds the handle of the screw, as shown by the dotted lines in Fig. 1, was lost. After some thought I came to the conclusion that the screw could be repaired by threading the end and screwing on a pipe tee. The projection A was sawed off and the end of the screw threaded for a ¾-in. pipe, whereupon a ¾-in. pipe tee, B, Fig. 2, was screwed on tightly. As a further precaution, a ¼-in. hole was drilled through the fitting, and the screw and a rivet inserted.

The handle was made of a piece of ½-in. pipe, about 12 in. long, threaded on both ends. After slipping the pipe

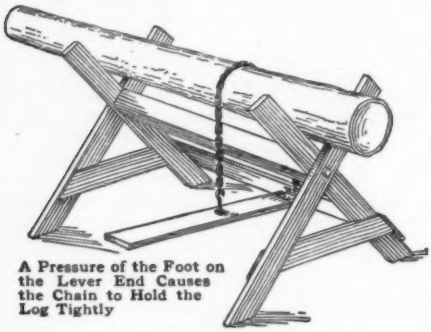


An Ordinary Pipe Tee Taking the Place of the Regular Casting on a Vise Screw

through the tee, the half of a ½-in. coupling was screwed tightly on the threads of each end.—Contributed by Clyde L. Adams, La Grange, Ill.

Wood Holder for a Sawbuck

Sawing wood on a buck is a very fatiguing job because the leg, in holding the log in the crotch of the buck, is in a very unnatural position. With



A Pressure of the Foot on the Lever End Causes the Chain to Hold the Log Tightly

an improvement on the ordinary sawbuck, as shown in the illustration, the foot is placed almost on a level with the ground in a position as if standing in front of the buck, not only making a natural and comfortable position, but also causing the log to be held much more firmly and without effort.

A piece of hard wood is nailed firmly on the two back legs of the buck near the bottom, a heavy eyebolt is screwed into it in the center and a chain attached. The chain should be long enough to reach over the largest log and down to the ground in front of the buck. A lever is hinged to the hardwood crosspiece near the center and extends to the front side of the buck. A hook is fastened in the front end of the lever in which to hook the links of the chain.

A log is placed in the crotch of the buck in the usual manner and the chain is brought over the log and a link placed in the hook of the lever while the latter is raised several inches from the ground. The lever is then pressed down by the foot and the sawing started.—Contributed by L. A. Suverkrop, New York.

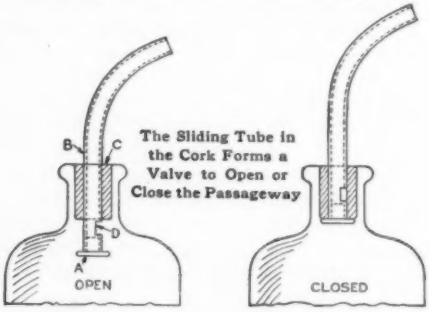
¶Automobile radiator leaks are often caused by steam pressure. To prevent this, keep the cap vents open.

Driving Nails in Cement

Cement would be used in many places, were it not for the difficulty of driving nails into it so that they will hold. If clean cinders are mixed with the sand and cement, the surface made with this material will hold a nail almost as solidly as if driven in wood. After giving this a thorough trial, I can recommend it for fence posts and nailing-places in basements.—Contributed by Harry Fritzinger, Decatur, Indiana.

Priming Bottle for a Gasoline Engine

A safe and convenient stopper for a bottle holding priming gasoline for an automobile engine is shown in the illustration, in which C is a common cork thrust into the neck of the bottle flush with the top and having a hole previously burnt through its center just a trifle smaller and to conveniently admit a piece of bent tubing. A piece of steel umbrella tube is quite satisfactory, says the Automobile Dealer and Repairer. At its straight end a slit, D, about ¼ in. long, is filed, and a plug, A, with a projecting lip, is tightly fitted into the end. Soldering this plug is not unwise, although not



The Sliding Tube in the Cork Forms a Valve to Open or Close the Passageway

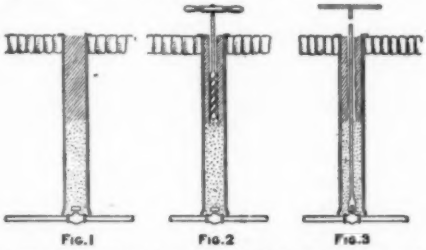
absolutely necessary, if it is made a tight fit. The head of a 20-penny wire nail will be found to fit snugly and serves the purpose quite well. To secure the cork in its position it is best to bind it down with twine or wire to the neck of the bottle. When the bottle is tilted the gasoline will flow

through the opening D and out through the tube B.

Evaporation and flow of the gasoline is prevented by drawing the spout up until the flange A is tight against the cork. It will be observed that the opening D will thus be closed, and no amount of rough shaking will make the gasoline escape. A stopper of this kind is very convenient to handle with gloved hands or cold fingers.

Shutting Off Water in a Frozen Stop Box

One morning during very cold weather I faced the combination of a burst water pipe on the inside of the building and a frozen stop box on the outside. The water could not be turned off at the stop box, as this had been left without cover so long that it had become filled to the top with dirt, Fig. 1, which apparently was frozen solidly all the way down.

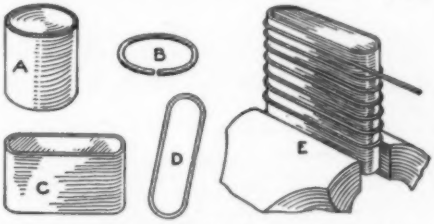


A Method of Reaching a Stop Cock by Boring through the Frozen Filling in the Stop Box

The prospect of digging being highly unpleasant, I procured a large auger and bored through 18 in. of frozen earth, Fig. 2, until I encountered mud. After this, it was not long until I had the key inserted, Fig. 3, and the water shut off.—Contributed by James M. Kane, Doylestown, Pa.

Forming Pot-Cover Rings and Bail Handles

A way to quickly shape a number of rings, bail handles, etc., for pans and pot covers is to use a piece of pipe as the form. Rings for pot covers are shaped by coiling the wire on a round pipe, A, and cutting the spiral on one side, as at B. Bail handles may be formed on a pipe that has been flattened as shown at C. A 3 or 4-in. pipe

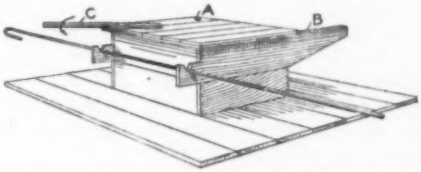


A Number of Pieces can be Shaped and Cut Quickly from a Length of Wire

can be easily shaped by hammering it while at a red heat. The wire coiled on this form is cut as shown at D. If the pipes are filled with lead, they can be easily gripped in the jaws of a vise, as shown at E, for winding the wire upon them. Rings and handle bails can be shaped on these forms from wire up to ¼-in. in diameter.—Contributed by Louis A. Brown, Washington, D. C.

Cover for a Well Curb

The open well that must be used occasionally can be covered or a curb provided that will prevent dirt from entering or any vermin from falling in, and yet be easily accessible for obtaining water. A platform is laid on joists and the curb built up over the well top. The feature of the protection is the cover, which is pivoted on a bolt, A, and turns around on the extension of the board B when the arm C is pulled in the direction of

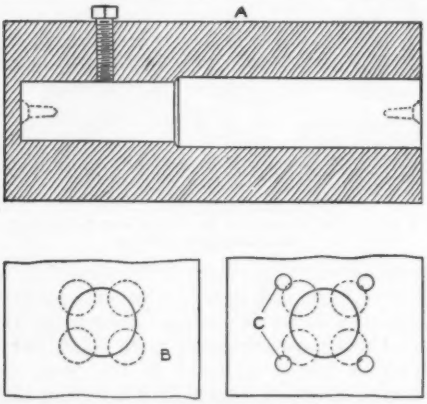


The Cover is Easy to Open and Close and It Keeps the Dirt Out of the Well

the pointing arrow. This covering is easy to open and close in stormy weather with snow or sleet on the parts.

Fluting Taps on a Drill Press

It often happens that a tap must be made for some special job and where there is no milling machine the flutes



The Shape of the Metal Piece for Holding the Tap Blank to be Fluted with a Drill

can be cut on the drill press either before or after threading the steel. The manner of doing this is as follows: Drill a piece of metal, as shown in A, the size and shape of the outlines for the finished tap. Drill and tap a hole for a setscrew as shown.

The flutes are cut with a twist drill, and the right size to use in making a 1-in. tap is a ½-in. drill. For other sizes increase or decrease the size of drill as necessary to make the flute the proper depth. The end of the metal is laid out as shown in B. If the metal is cast iron, small holes should be drilled and steel pins inserted, as shown at C, on the line of the outer edge of the four circles. These pins should be a driven fit. The blank piece for the tap should be turned up straight to fit the hole drilled for it in the block, then, after drilling the flutes, it is shaped as desired. Four holes drilled as shown cut the flutes in the metal of the tap.—Contributed by J. F. Tholl, Detroit, Mich.

¶A stove polish of good quality consists of 2 parts graphite, 4 parts copperas and 2 parts boneblack, mixed with water to form a paste.

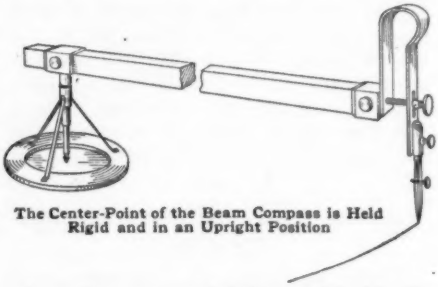
Polish for Brass or Copper

A very good polish for use on brass and copper is described by the Modern Painter as follows: Sodium chloride, 2 parts; oxalic acid, 3 parts; water, 40 parts; bolted pumice, 100 parts; oil of turpentine, 2 parts; soft soap, 12 parts; lard oil, 12 parts. Dissolve the salt in water and the acid in this solution. Mix the solution with the powdered pumice; incorporate the soap; then heat in the oils.

Center-Point Holder for Beam Compasses

Having frequent use for a beam compass and finding it a difficult matter to overcome its tendency to tilt from side to side, which very often injured my layout, I made the device shown in the sketch.

A metal disk with a glass center set flush with the bottom surface is used for the center end of the beam. In the center of the glass is a countersunk hole for the end of the beam center. The glass enables the workman to see the drawing and the place to set the center. This device prevents any injury to the drawing. A sleeve of heavy brass tubing is supported with three braces directly over the countersunk hole in the glass disk. The shank of the compass center fits into this sleeve, and the point centers the countersunk hole. This tripod arrangement



The Center-Point of the Beam Compass is Held Rigid and in an Upright Position

gives the center rigidity and holds the beam in an upright position, preventing any side motion.—Contributed by Francis X. Kuchler, Baltimore, Md.

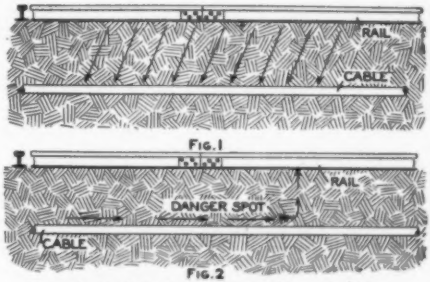
Electrolysis on Underground Cable Sheaths

By GEORGE LITTELL

While it is an established fact that underground cables are cheaper to maintain, are less subject to disturbances of the weather and, therefore, less liable to failure than overhead wiring or aerial cables, it is also well known that the maintenance of the underground plant is no small item. The greatest bulk of the expense of the underground system is caused by electrolysis. While this action affects any and every kind of metal that is laid underground, it is particularly the sheath of underground cables that suffers. This is due to the fact that the armor is almost pure lead and, therefore, offers very little resistance to the current flowing through it.

Electrolysis, as the linemen use the word, means the eating away of the cable sheaths by the stray currents from street-railway or other grounded high-tension circuits which seek an easy return to the power house and, for this reason, jump from the rail or other conductor and enter the sheath of the underground cables, or any other conductor which offers less resistance to its homeward journey.

Except in rare instances, the current, in flowing from one kind of conductor to another, will be compelled to pass through the earth, and it is at the points where the current emerges from the conductor and enters the moist earth that electrolytic action occurs, to the probable destruction of the cable, or other conductor. Therefore, if voltmeter tests show that the current is flowing to the cable sheath from surrounding conductors, it proves that the sheath is negative and that there is little or no chance for electrolysis to get in its work. If, on the other hand, the sheath is found to be positive, and the current is flowing from it to surrounding conductors, the maximum positive point on the cable must be determined, and a heavy copper or other suitable bond must be run from this point to the rail or return feeder of the electric-railway system, or other conductor to which the readings indicate the current to be flowing. The direction of the current which is harmless to the cables is shown by the arrows in Fig. 1, and the direction of



Electrolysis Attacks the Spot Where the Current Leaves the Sheath for a Return Route Offering Less Resistance

harmful currents by the arrows in Fig. 2, which also shows the location of the place most attacked.

As lead is corroded by electrolysis almost twice as rapidly as tin; more than twice as rapidly as copper or iron and 12 times as rapidly as aluminum, it can be readily understood that the underground cable sheath will be injured much more quickly than iron pipe which may form a network all around it. Under certain conditions, due probably to the fact that the energy expended per unit area of the sheath surface may not be great enough to decompose the salts in the damp earth, it sometimes happens that the current will leave the conductor sheath without harm to the metal; and because the character of the earth around the pipe may have become changed by the decomposition of its salts, thus rendering it incapable of acting any longer as an electrolyte, electrolytic action may take place for a while and then cease altogether.

One of the most peculiar things, and there are many of them connected with electrolysis, is the fact that very often —in fact, in the majority of cases—

the affected cable appears to be all right, unless it is gone over with the hand or happens to be situated in such a position that a good light can be thrown upon it. If the hand encounters the corroded spot, the sheath will be literally wiped off under the pressure. The corroded spots may be readily detected by a good light on account of the reddish tinge which denotes that the damage is complete, and it only remains for a heavy rain to soak the cable and cause trouble.

On account of the continual changes in underground conditions, many companies have every cable in each manhole tested at least twice a year, and often three times. The record of these tests is kept for reference, and whenever cables are shown to be in a dangerous condition, a test man is appointed to see that everything possible is done to prevent electrolysis from completely destroying them, thereby reducing, as much as possible, the trouble arising from this cause.

In testing for electrolysis two poles are used, about 7 ft. long and each having a sharp metal point on one end to which is attached a heavily insulated copper wire. This wire is in turn connected to a millivoltmeter. The point of one rod is then placed upon the cables, one at a time, while the end of the other pole is placed in contact with any surrounding conductors, such as water pipes, gas pipes, rails of the street railway, or the like, and the difference in potential is carefully recorded, as is also the direction of the current.

If continuous rails were laid by the street-railway companies, or a two-wire overhead system established instead of using the ground return, the danger of serious damage by electrolysis would be largely eliminated. The former method is impracticable at present, as there is no way to take care of the expansion and contraction which would naturally follow changes in the weather. The two-wire overhead system could be used where there is a good straight run with but few turns and crossings, but such conditions seldom exist in cities, and it would be useless on country and suburban lines, as underground cables are not used in the country. Under present conditions, therefore, little can be done to overcome the damage by electrolysis. One of the main things to do is to bond the cables together. The bonds are placed between all cables in each manhole through which they pass, and the bonding ribbon is soldered to the sheath of each cable, as shown in Fig. 3, plenty of slack being left between cables to allow for the bonding of any additional cables which may be pulled through the manholes at some future time.

Next in importance to the proper grounding of the cables is to make the trolley the positive side of the system. To this end, the trolley track should be thoroughly bonded and the bonds maintained in good condition, as a poorly bonded rail joint allows the return current to escape from its proper conductor very readily; and, further, any metallic connections which may exist between piping or lead-cable systems and the track should be immediately located and removed. Where cables or underground conductors pass under tracks or through regions where they are exposed to electrolytic action, they can often be protected by being covered with glazed tile or by placing them in a trough filled with asphalt. The latter method is not practical, however, for a telephone or power cable, as these sometimes must be removed hurriedly to relieve a case of trouble, and imbedding them in asphalt would necessitate digging up the ducts, laying a new conduit and pulling in and splicing new cables.

As nearly all underground cables are placed in vitrified-clay ducts, electrolysis usually attacks the cables in the manhole, the clay duct being more or less an insulator, but if the duct is damaged at some point, the cables are often attacked in the ducts.

The cable sheath attacked by electrolysis is not entirely destroyed, but the damaged part usually appears as a large reddish spot, a long narrow strip

or several small spots, where the lead has been turned into a sort of paste which can be wiped off with the hand.

It has been proven that one ampere of current will corrode 75 lb. of lead in one year. As the largest sheath weighs about 5 lb. per foot, it can be readily understood that the time in which electrolysis will ruin a cable is less than six months. With the rapidly increasing size of the cables, many of which contain over 600 pairs, or 1,200 separate wires, the thickness of the armor necessarily decreases, as the larger cables must have lighter armor, or it would be almost impossible to handle them without the aid of a traction engine, and this thin sheath or armor makes the conditions all the more favorable for serious damage through electrolysis.

This article does not pretend to give a definite remedy, yet, if the precautionary measures described are taken,

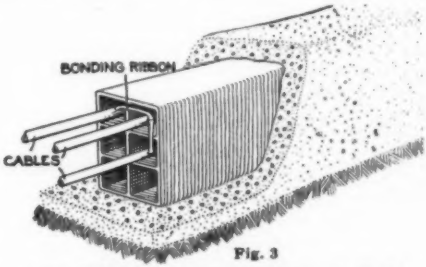


Fig. 3

The Cables are All Bonded Together in Each Manhole of the Entire System

not only may the cost of maintenance be kept down, but in the course of this work some one may perhaps devise a means of effectively preventing electrolytic corrosion of underground metal conduits.

Tieless Stencil to Make Designs in Relief

The tieless stencil of the Japanese appears to be made of three parts, namely, two stencil designs, exactly alike and cut in very thin waterproof paper, with an open-mesh silk cloth placed between them and the whole pasted together.

A correspondent of the Painters' Magazine partially adopts this method to make tieless stencils for producing relief effects as well as for ordinary stenciling. The manila-paper stencil of the fleur-de-lis would necessarily require ties as shown in Fig. 1. If a thick stencil is used, the whole being attached to a piece of ordinary window screen, Fig. 2, and used in the manner shown in Fig. 3, with a thick relief mixture, the finished design, Fig. 4, will be formed without ties and raised as high as the thickness of the stencil paper used.

The screen should be a trifle larger all around than the stencil paper, the edge being turned over the paper and both sides given a coat of shellac. Such a stencil can be used successfully anywhere. It should be cleaned with a small hand scrubbing brush so

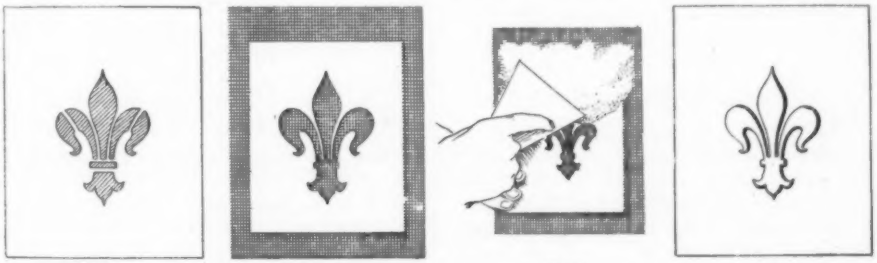
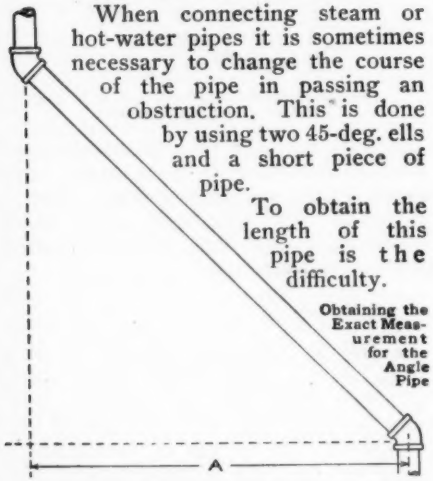


Fig. 1 Fig. 2 Fig. 3 Fig. 4

Making a Design in Relief with a Tieless Stencil, the Height of the Relief Being Equal to the Thickness of the Stencil Paper

as to keep the wire perfectly clean. When using such a stencil on friezes, it is well to lay out the spacing so as to keep away from the corners, as it is almost impossible to bend the wire into a sharp corner without injury to the stencil.

Rule for Angle-Pipe Measurement



When connecting steam or hot-water pipes it is sometimes necessary to change the course of the pipe in passing an obstruction. This is done by using two 45-deg. ells and a short piece of pipe.

To obtain the length of this pipe is the difficulty.

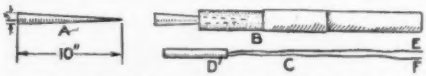
Obtaining the Exact Measurement for the Angle Pipe

The following rule will determine the right length for the pipe. Measure the distance in inches from center to center, A, as shown in the diagram. Then multiply by the number 53 and divide the result by 128, finally adding to the quotient the distance A between centers and reducing the sum to feet. —Contributed by Roy Airth, Renfrew, Ontario.

Clearing Fields of Stumps

There are several good methods of accomplishing this work, varying with the conditions. Probably the most common method is the use of dynamite. A 1¼-in. hole is drilled deeply into the center of the root and a half stick, or if a very large root, a whole stick of dynamite is inserted. The sketch A shows a wood stick which is carefully inserted into the open end of the dynamite cartridge after the paper covering has been laid back, as shown in sketch B. The exploder or cap D, in the sketch C, is then placed in the opening made by the plug and the paper folded in around it. The terminals E and F of the cap are connected to a hand machine, but if such a machine is not obtainable, the charge may be exploded by connecting them to a four-cell dry battery. Care should be exercised before making the final touch, or connection. Usually about 60 ft. of No. 12 insulated lamp cord is used between the exploder leads and the battery leads, the two wires being run separately. Some fine sand, or better still some heavy clay, should be well rammed on top of the dynamite before it is exploded. The ramming should be done with a small wood rod and should not be done with too much force, several light taps being better than a few heavy ones, and much safer.

Where it is desired to fell some standing timbers, the following method may be used to good advantage. A trench, about 1 ft. wide, is dug all around the tree and deep enough to uncover all of the lateral roots. These roots must be cut off so that the stump has no bond to the earth. Heavy iron timber hooks are then mauled into the stump and strong chains passed around the stump. Another long chain is attached to the upper part of a piece of standing timber and its free end made fast to the chains and hooks on the stump. The tree should fall halfway to the ground before the strain comes on the chain and slack enough to allow this should be left in the chain.



Method of Setting the Exploding Cap with Its Connections in a Stick of Dynamite

The tree is then cut so as to fall from the stump. If the tree is a large one, several stumps may be hooked to it. The fall of the tree will remove the stumps.

The third method is not only practical for splitting stumps, but can also be used for splitting up timbers. The

holes are bored in from the top of the stump, instead of at the bottom, and they should be bored down to 3 or 4 ft. below the ground. This method causes the stump to split so that the pieces can be used for fuel. If logs are to be split by this method, a line should be drawn across the butt and 1-in. holes bored every 5 in. to a depth of about 3 ft., and black powder or guncotton used as the explosive. After the logs are halved by this method, they may be further reduced by the same method or with an iron wedge.

It should be taken in consideration that all explosives are uncertain in their action, and the operator should always remain at a safe distance, using plenty of wire with dynamite, and plenty of slow-burning fuse with gunpowder or guncotton. Dynamite cartridges may be cut in half by scoring around the center with a knife, then breaking by gripping each end firmly in the hands with the thumbs on the cut. Do not shake or jar dynamite.—Contributed by G. M. Petersen, Buffalo, New York.

Cutting Smooth Holes in Glass

Boring a hole through a glass disk or plate is not a simple matter. It is far easier to pour melted paraffin over the glass, building it up into a tiny cup or crater, and carefully scratch away the wax from a spot the exact area of the desired hole as shown in the sketch. Then, pour a little hydrofluoric acid—the "diamond ink" of the trade—in the paraffin cup and it will quickly eat through the unprotected spot, producing a hole without any cracks. As the vapors of the acid are very dangerous, one must work in a strong breeze that blows the fumes away from the face.—Contributed by Harry N. Holmes, Richmond, Ind.

¶The grip of a motor-fan belt may be revived by cleaning it with gasoline, then allowing it to soak in castor oil for 12 hours.

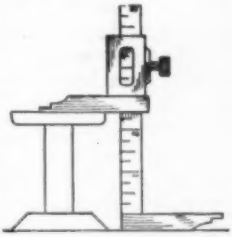
Substitute for a Large Pipe Wrench

On a hurry-up job where a large pipe wrench would have been used, had one been at hand, I made the temporary device illustrated which accomplished the work admirably. The pipe to be turned was 4 in. in diameter. The device was made of a 2-in. pipe, a 2-in. tee and a chain. The pipe was turned into the tee tightly, and the chain given two turns around the pipe to be turned and through the tee as shown. —Contributed by E. M. Fish, Kansas City, Mo.

A Substitute Pipe Wrench for Large Work, Constructed of Parts Usually Found on the Job

Sliding-Jaw Caliper as a Height Gauge

Reverse the sliding jaw on a pair of bar calipers and a convenient height gauge may be extemporized. This is shown by the sketch. The head or fixed jaw is usually ¼ in., ½ in., or some other easy fractional size which makes its addition to the scale reading very simple. The applications of such a tool are numerous.



To Remove Signs from Glass

A way to remove painted signs from glass windows and fixtures in machine shops is to apply a coating of ether several times, rubbing the sign and allowing the vapor to dissipate in the air. The paint is easily removed and the glass cleaned from all grease. Ether will burn, so that matches should be kept away from it while being used. —Contributed by Loren Ward, Des Moines, Iowa.

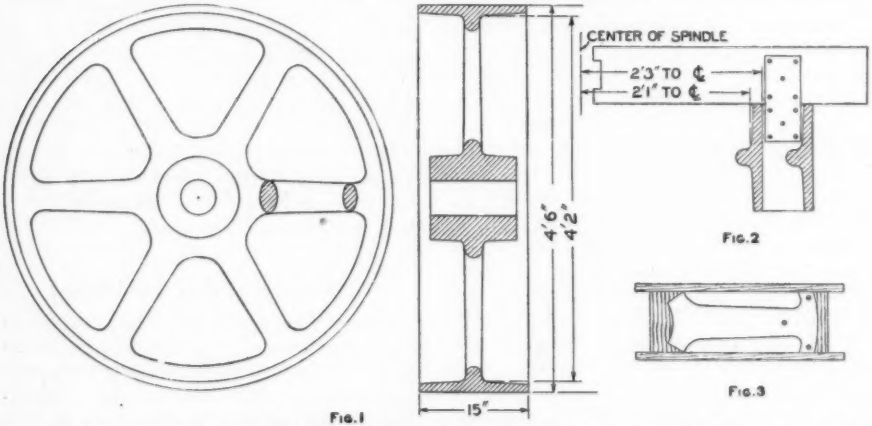
Flywheel Pulley Molds Made with a Sweep and Cores

To make flywheel pulley molds of different diameters, but with the same size arms, hubs and width of rim, the arrangement shown in the illustrations will be found much simpler than the methods usually adopted for this class of work.

Let the sketch Fig. 1 represent two pulleys of similar construction but having different diameters. The outer and inner sides of the rims of both pulleys, and the bed for setting the cores are "struck up" with a spindle and one sweep, the arm for making the rims being fastened to the sweep with batten and screws and readily adjustable to suit conditions. The sweep and batten are shown in Fig. 2. The arm is shown in position for making the inner side of the larger pulley, and by moving the outer or straight side to a point where it will coincide with the 2-ft. 3-in. mark on the sweep the arm will be set correctly for the outside. The same procedure is, of course, followed in setting the arm for the smaller wheel.

The core box, Fig. 3, for the pulley arms is made half the width of the rim, or 7½ in., in depth, and wide enough to take in one-sixth of the hub and its surrounding bead. The half arm fastened to the bottom of the box is cut off far enough from the rim to accommodate the loose pieces that are fitted to the box, to decrease its diameter and make the end of the arm of the smaller pulley. Two of the cores from this box are clamped together to make a whole arm, making the depth or thickness of each arm core equal to the width of the rim, or 15 in. for the one shown.

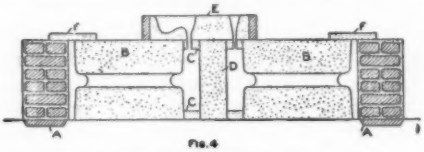
The mold is made in a pit of suitable depth in the foundry floor. The spindle is placed in position in the center of the pit and the bottom "struck up" level, using the straight side of the sweep for this operation. Bedded in flush with the level bottom of the pit is a cast-iron plate, AA, Fig. 4, of suitable diameter and provided with four lifting lugs. The plate is wide enough to carry two courses of brick, laid in and faced with loam, for the outside of the rim, the whole being lifted away to be dried, while the arm cores BB are located, and the inside of the rim between the arm cores is being swept up in green sand. Two flat cores, CC, of the same diameter as the hub and provided with holes to take the bore core D, are used to cut the hub off to the required



Two Flywheel Sizes to be Made over the Same Hub and Spoke Dimensions, the Sweep for Striking Up the Rims and the Core Box for Making the Spoke Cores

length. A cope, E, is made for the hub only, the rim being covered with suitable cake cores, FF.

To make this pulley with internal flanges on the rim, it is only necessary to put a loose piece of the flange in the arm-core box and add a piece to the sweep to remove part of the green sand between the cores to form a mold for the flange. This suffices for the flange on the top side of the mold, but for the bottom where it is inconvenient to sweep up the flange, a loose segment of flange long enough to reach from the outside of one arm core to the outside of the next will be required. This segment is put in place before filling in with green sand and is taken away as soon as one section is finished and moved to the next.



A Cross Section of the Complete Mold, Showing Position of the Cores in the Struck-Up Mold

The mold formed by the piece of segment placed in the arm-core box provides a guide for setting the flange segment in the bottom of the mold.—Contributed by James J. Hill, Brooklyn, N. Y.

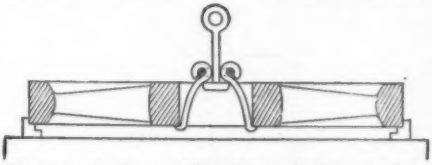
Holder for Gasoline-Engine Gaskets

A gasoline engine I owned would continually blow out the asbestos gasket at a slight overload. To remedy this, I cut a piece of ordinary wire screen the same shape as the gasket and placed it over the asbestos packing. The wire of the screen imbeds itself in the asbestos, holding it firmly, and thus prevents a blowout.—Contributed by H. C. Heidt, Chicago, Ill.

¶Red lead and putty, mixed with boiled linseed oil into a soft mass, is used to stop up crevices in cement-brick walls or for cracks in stone after the priming coat of paint.

Tongs for Lifting Locomotive Drive Wheels

A simple device employed in a railroad shop for lifting locomotive wheels, and which could also be used to advantage for lifting large pulleys, etc., is shown in the accompanying illustration taken from Machinery. It consists essentially of three prongs or hooks (one of which is not shown), made from ¾-in. round iron, a welded ring and an eye having an enlarged end which spreads the hooks so as to grip the wheel by the hub, when a pull is exerted on the eye.



Hooks are So Arranged That They will Enter the Axle Hole and Grip the Hub of the Wheel

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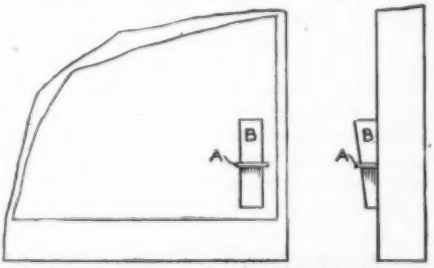
Bulletin-Board Holders

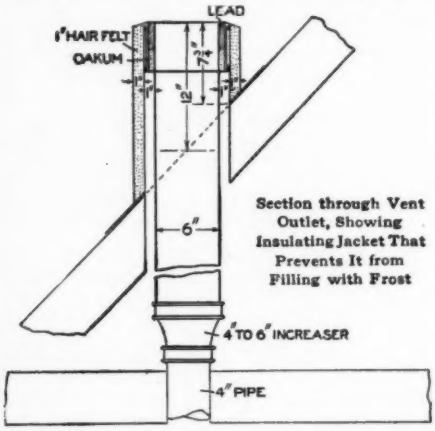
Many different devices are used to hold newspaper bulletins on bulletin boards, but most of them are rather crude and unsatisfactory. The holder shown in the sketch is very easy to make and to use. Drive four double tacks into the bulletin board, which are so placed that, when the bulletins are put on, the tacks, A, will be near the corners of the paper. The paper is pressed down over the tack, and the wedges BB inserted through the loop.—Contributed by Abner B. Shaw, N. Dartmouth, Mass.



The Bulletins are Attached with Wedges through Loops Located at Each Corner of the Board

Protecting Vent Pipes from Frost

The inspection department of a Canadian city has recognized the danger to public health which might



Section through Vent Outlet, Showing Insulating Jacket That Prevents It from Filling with Frost

result from the closing of stacks by frost and the possible exposure to the effect of sewer gas passing through unsealed traps unknown to the occupants. Accordingly, to lessen the chance of this happening, a by-law was passed by the city making it compulsory for house owners to protect all pipes from frost closure where they pass through the roof, says a correspondent of the Metal Worker.

The protection advocated by the plumbing-inspection department and made compulsory by the by-laws is shown in the sketch, wherein a 4-in. pipe is enlarged two sizes, that is, to 6 in., at a point inside the building. This is a common practice throughout the country and is generally sufficient to secure the maintenance of a clear passage to the open air in severely cold weather when the moisture in the air passing through the pipes freezes and builds up a wall of ice on the inside of the pipe.

Under extreme conditions, it appears that this building-up process is so rapid that the bore of the pipe is sometimes closed, and to retard it, the wall of the pipe is insulated right to its extremity by a double jacket of sheet metal, between the walls of which is inserted a sheet of hair felt, 1 in. thick. Additional resistance to the effect of the cold is afforded by an air space gained by the extra diameter of the hub. As will be seen from the illustration, the finishing cap of the sheet-metal jacket is made so that the inner shell fits inside the hub, and is calked into it with another shell which allows for the provision of a water and air-tight joint at the mouth of the pipe. There is thus provided an air space between the insulated jacket and the pipe, and the warmth of the building and of the air passing through the pipes are counted upon to prevent the accumulation of ice on the walls of the pipe after it has passed through the roof.

To Repair a Broken Steel Tape

The steel tape is the only measure which can be used with satisfactory results on long distances, where accuracy is required, and these tapes on account of their thinness easily become kinked and break if care is not taken. The following device is a homemade affair which I use for punching the holes to rivet a patch over the break, as it is difficult to punch holes in the tape in the ordinary way without splitting the metal. It also acts as a gauge to get all the holes alike so the tape will have exactly the same length when the repair is completed.

Procure two plates of iron or steel,

The Ends of the Tape are Held Tightly in Place for Punching the Holes Accurately

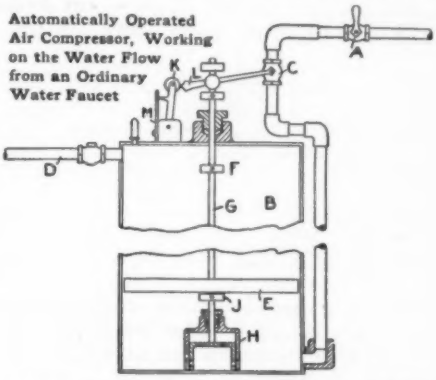
about 1½ in. wide by 4 in. long and $\frac{1}{16}$ to ⅛ in. thick. Clamp the two plates together and drill two holes in diagonally opposite corners for two small bolts to hold the pieces together. Drill four holes as shown, the required size for the rivets to be used, and about ⅜ or ½ in. apart. All the holes should be drilled with the two plates clamped together so that they will be exactly alike in both plates.

Loosen the nuts and insert the tape between the plates so that the broken joint will come between the two inner holes, as shown. Through a small slot, which is cut in one plate only, the break can be seen and the parts of the tape adjusted to the proper place. Clamp the parts together tightly with the bolts and punch the holes with a punch which fits the holes in the plates. In the same manner punch a thin piece of steel to lay over the broken joint—an old corset steel will do. Rivet the piece to the tape and the result will be a perfect splice.—Contributed by J. G. Anderson, Smithshire, Ill.

Automatic Air Compressor

For the many uses where a moderate air compressor is desired the compressor illustrated will be found very convenient. It is operated by being connected to a water faucet and works as follows:

Upon opening the faucet A, the water is admitted to the sheet-iron cylinder B through the valve C, and as the water rises, the air is compressed and forced out through the pipe D to the reservoir. The float E is carried up with the rising water until it strikes the collar F, then the rod G is raised slightly, thereby closing the water valve C and opening the water-discharge valve H. As the water recedes, the float E will strike the collar J, which closes the discharge valve and opens the water valve C. The operation is then repeated.



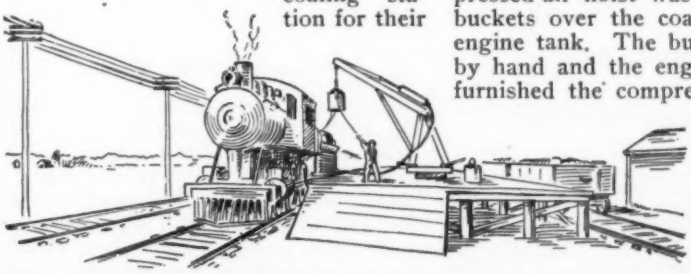
Automatically Operated Air Compressor, Working on the Water Flow from an Ordinary Water Faucet

The roller K, bearing against the cam L, on the end of the water-valve spindle, is actuated by a spring M for the purpose of assisting in opening and closing the valves quickly, thereby preventing any possibility of both valves being partly open, which would put the compressor out of commission.—Contributed by Chas. Henry, Chicago.

¶A welding compound is composed of two parts powdered borax to one of clean sand.

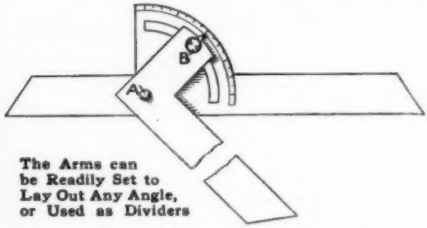
Compressed-Air Coal Hoist

The owners of a small railroad could not afford to build an elaborate coaling station for their engines, and in its stead they constructed a derrick on which a compressed-air hoist was used to lift the buckets over the coal bunker on the engine tank. The buckets were filled by hand and the engine being coaled furnished the compressed air for the hoist. The hose from the air hoist was connected to the air hose of the engine.—Contributed by J. J. O'Brien, Buffalo, N. Y.


Taking on Coal with an Air Hoist, Operated by Compressed Air from the Engine, the Coal Buckets being Filled by Hand on the Platform or from Cars

A Homemade Bevel Protractor

This very handy combination tool can be constructed of parts cut from sheet brass about $\frac{1}{16}$ in. thick. A pro-



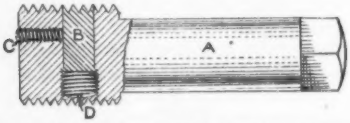
The Arms can be Readily Set to Lay Out Any Angle, or Used as Dividers

tractor gauge is either engraved or etched with acid. The hinge may be formed as shown in the sketch, or instead of using a rivet at A and a knurled screw at B, a knurled screw can be used at A only, thus doing away with the semicircular slot. This latter method would not make as rigid a tool, yet it would serve the purpose for light work. The ends are cut on an angle to provide points which may be used as dividers.—Contributed by Lorenz Schneider, Jonesboro, Ark.

An Expansion Tap

Every machinist knows that it is practically impossible to tap all holes exactly alike, unless the same amount of stock is left for the tap each time. The expansion tap shown in the illustration was originally designed by a correspondent of American Machinist to retap threaded holes in which varying amounts of stock had been left before the first tap had been run through.

The body A is made of machine steel,



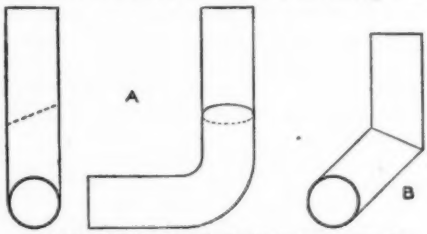
A Portion of the Threads are Adjustable, so That the Tap Size may be Increased

and the adjustable cutter B is made of tool steel, tempered. The hole for the cutter B is drilled before the body is threaded. The thread on the end of the body is slightly tapering, in order to insure that the tap may enter squarely each time.

After drilling, the cutter is inserted, backed by the headless setscrew D and locked in position by the screw C. The adjustment of the cutter is obtained by the screw D. The tap will also be found useful in recutting internal threads which have become bruised.

Offset Pipe for a Bathroom Fixture

In setting a bathroom fixture to another plumber's "roughing in," I found that the apron of the lavatory extended too far toward the closet opening, and as this opening was set in a concrete floor, it could not be changed. In order to be able to set the lavatory far



An Offset Made in a Flush Elbow to Change the Location of a Lavatory

enough away to allow the flush tank of the soil basin to be put in straight, I used the method shown for offsetting the pipe. A 2-in. flush elbow was sawed on an angle, as shown by the lines in A, and the parts turned enough to make the offset as shown in B, whereupon the joint was soldered. This made the offset 3 in., and the finished job had a neat appearance.—Contributed by Jas. A. Eddy, Stigler, Oklahoma.

Cleaning Brick Walls

A solution or wash suitable for cleaning brick walls is described by the Blacksmith and Wheelwright as follows: For every 5 gal. of water add 2 oz. of muriatic acid. This wash should be applied to the wall and scrubbed down with a wire brush. Care should be taken to keep the solution from touching the hands or clothes.

How to Make a Slide Rule

The slide rule is a very useful instrument to anyone who may have numerous mathematical operations to perform, as its manipulation is very simple, and results that are quite accurate may be obtained in a great deal less time than by the ordinary processes of multiplication and division. The ordinary slide rule is not at all mysterious, as it is nothing more—so far as theory is concerned—than a simple application of what is called logarithms. In order to understand the operations of a slide rule, that may be used in performing the operations of multiplication and division, it will be necessary to have a general understanding of the use of logarithms.

If any number, say 12, for example, be multiplied by itself, or squared as it is called, the result will be 144, and the exponent of the power to which the number is raised is called the logarithm of the result to a base corresponding to the number itself. That is, $12^2 = 144$, and 2 is said to be the logarithm of 144 to the base 12. The base commonly used is 10, and the logarithm of any number to this base is equal to the exponent of the power to which 10 must be raised in order that the result may be equal to the number. Thus, the logarithm of 100 is 2, because 10 raised to the second power is equal to 100, and the logarithm of 1,000 is 3, etc. The logarithms of other numbers have intermediate, larger or smaller values than the above, depending upon the value of the number. A table giving the values of the logarithms of numbers from 1 to 1,000 can be purchased at most any book store for a few pennies.

The logarithm of any number is made up of two parts, called the characteristic and the mantissa. The characteristic is the integer portion of the logarithm and the mantissa is the endless decimal portion, thus the logarithm of 7,770 is 3.8904. The figure 3 in this case is the characteristic and .8904 is the mantissa. The characteristic is positive if the number is greater than one and negative if the number is less than 1. The mantissa is always positive. The numerical value of the characteristic is always one less than the number of figures in the number to the left of the decimal point, and the mantissa is the same for all numbers that differ only by the position of the decimal point. Thus the logarithm of 777 is equal to 2.8904, the logarithm of 7.77 is equal to 0.8904, and the logarithm of .00777 is equal to $\bar{3}.8904$. The dash over the 3 in the last case means the characteristic is negative and in the addition or subtraction of logarithms it should be treated as such. In all logarithmic tables only the mantissa is given, as the characteristic can be easily added.

Two numbers may be multiplied by means of logarithms as follows: Look up the value of the logarithm of each number in the table, add these two logarithms, and look up the number in the table having a logarithm corresponding to the sum of the logarithms of the two numbers to be multiplied.

If one number is to be divided by another, the above operation is reversed; that is, the logarithm of the divisor is subtracted from the logarithm of the dividend, and the result will be the logarithm of the quotient.

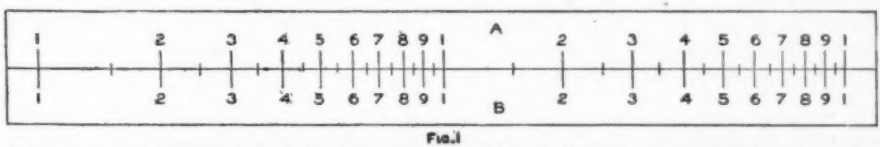


FIG. 1

The Scales with the Divisions Marked in Proportion to the Difference between Logarithms of Numbers from 1 to 10. One Scale is Pasted to the Slide and the Other to the Rule Base

The value of the quotient can then be obtained by making use of the table of logarithms.

Both of the above operations may be performed mechanically in the following simple manner: Take two pieces of pasteboard each about 1 ft. long and 1 in. wide. One edge of each of these pieces should be perfectly straight so that they will move by each other without any crack being produced between them. Now, while these two pieces are exactly opposite each other, as shown in Fig. 1, mark off divisions on them the lengths of which are proportional to the difference between the logarithms of the numbers from 1 to 10, starting at the left end and making the divisions of such size that number 10 comes in the center. Duplicate this ruling on the right end, starting with number 1 in the center. The space between the main divisions just made should now be marked off in such a way that the same relation exists between the small divisions as exists between the difference in the logarithms of the tenths lying between the whole numbers. Thus the space between the first two marks should be divided into 10 parts which bear the same relation to each other as exists between the difference of the logarithms of 1, 1.1, and 1.2, and so on, up to 2. Each of the large divisions should now be marked 1, 2, 3, etc., starting with 1 at the left end and ending up with 10 in the center; the right-hand end should be marked in a similar manner, starting with 1 in the center. The rule is now practically complete and it may be operated as follows:

Supposing it is desired to multiply 2.5 by 3. Place the figure 1 at the left-hand end of the part B directly beneath the ruling on the part A corresponding to 2.5, and then determine the value of the number on the part A directly opposite the figure 3 on the part B. If the ruling has been properly made, the result will be exactly correct. The setting in the above case may be reversed; that is, the figure 1, on part B, may be placed opposite the figure 3, on part A, and then the number, on part A, directly opposite the figure 2.5, on B, determined, which should be the same as in the previous case.

In dividing one number by another, the above operation is just reversed. The number on part B, corresponding to the divisor, is set opposite the number on part A, corresponding to the dividend, and the quotient may be read off on A, it being directly opposite the number 1 on the left-hand end of part B.

The satisfactory operation of the rule will depend entirely upon the accuracy of the rulings on the parts A and B, and the following suggestions may be of some service in marking off these divisions. Determine the exact center of the rule and then measure off 5 in. to the right and left. Now obtain the use of an accurate scale that is marked off in hundredths of an inch, or smaller fractions, and mark the positions for the numbers 2, 3, etc., on the rule by use of the accompanying table, which gives the logarithms of the numbers from 1 to 10:

Number	Logarithm
2	.3010
3	.4771
4	.6021
5	.6990
6	.7782
7	.8451
8	.9031
9	.9542

Thus the mark corresponding to number 2 should be placed 301 thousandths of the distance from the left end to the center of the rule—in this case 5 in. The exact position of the mark for number 2 would be .3010 of 5, or 1.5050 in., from the left end. Number 3 would be .4771 of 5, or 2.3855 in., from the left end, etc. The small divisions between each of these large divisions should bear the same relation to each other as exists between the difference of the logarithms of the intermediate numbers. An easy method of marking off these divisions is as follows: Lay out a right angle on a plain piece of paper, as shown in Fig. 2. On the vertical line AB measure off points corresponding to the logarithms of 1.1, 1.2, 1.3, etc., up to 2. It would be best

to multiply each of the logarithms by 10 in order to increase the scale of the drawing. From each of the points marked on the vertical line AB, draw a straight line to the point C. Then

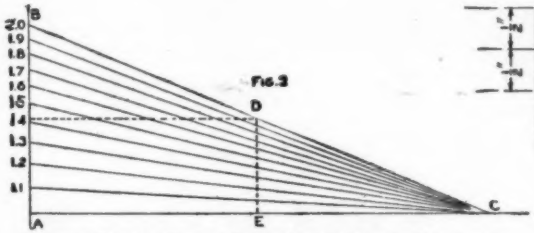


Diagram Showing How to Determine the Length of the Small Divisions on the Scales

draw a horizontal line exactly parallel to the line AC and located a distance above it equal to the value of the largest division on the rule. From the points where this horizontal line intersects the line BC, draw a perpendicular line to the line AC. Thus the dotted horizontal line in Fig. 2 is drawn a distance above AC equal to the distance between the numbers 1 and 2 on the slide rule, and the line DE is perpendicular to AC. The distances from the point E to the intersections of the various slanting lines passing through C are equal to the distances that must be marked off on the rule, Fig. 1, at the left-hand end, to correspond to the numbers 1.1, 1.2, 1.3, etc. The line AC should be long in comparison with AB in order to obtain accurate results. The values of the divisions between the numbers 2 and 3, etc., on the rule are obtained by marking off on the vertical line the differences between the logarithms of the numbers 2.1, 2.2, etc., up to 3, and the logarithm of 2, and proceeding exactly as in the previous case.

Logarithmic cross-section paper may be purchased for a few cents a sheet and the necessity of making the above rulings is thus eliminated. A strip of this cross-section paper may be pasted on the two parts, A and B, that are to form the rule, while they are exactly opposite each other and as close together as possible, and allowed to dry. When perfectly dry the paper may be cut with a sharp knife and a straightedge along the crack between the pieces of pasteboard.

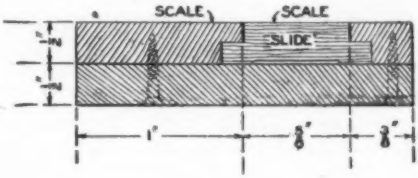


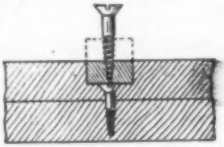
Fig. 3

Cross Section of the Rule with Dimensions of the Parts and Showing the Location of the Scales

A much more serviceable rule may be made by pasting the paper on pieces of wood instead of pasteboard. These two pieces of wood may be made so that one slides in a groove cut in the other and the two edges are always held against each other. The cross section of a possible arrangement is shown in Fig. 3.

Removing Plugs That Cover Screw Heads in Patterns

The patternmaker who uses plugs for filling up screw holes will find the method illustrated to be very useful for the removal of plugs without damage to the hole.



In case there are screws to be taken out of an old pattern, the first thing to do is to remove the plugs, which may be easily accomplished by turning a screw into the plug in the center or directly over the screw head covered by the plug. When the point of the screw, being turned in, strikes the head of the other screw, the plug will be raised out of its setting by the action of the threads on the screw being driven against the set screw.—Contributed by G. Crawford, Schenectady, New York.

An Emergency Screwdriver

Once, having no screwdriver at hand, I made a good substitute by fastening a small washer between two nuts on an

The Washer is Used in the Same Manner as the Blade of the Screwdriver

ordinary machine bolt. The washer served as the screwdriver blade, and the bolt as the handle.—Contributed by G. H. Holter, Jasper, Minn.

Knurling with a Threading Tool

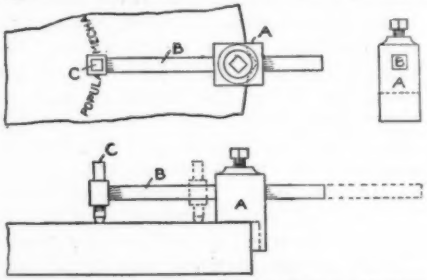
On one occasion my work required some knurling and not having a knurling tool I accomplished the work in the following way: The lathe was geared to cut 20 threads to the inch, and after placing the work in the lathe centers, a cut was taken with a V-threading tool. The gears were then changed to cut a left-hand thread of the same number to the inch, and a thread cut over the first threads in a reverse manner. This gave a knurl equal to a knurling tool, which in some ways was better, as the edges of the cuts were square and clean. The pitch of the thread may be varied to suit the size of knurling desired, but I found that 20 threads to the inch is suitable for most purposes.—Contributed by Geo. Garrison, E. Orange, New Jersey.

Stamping Letters into Metal

In stamping a straight or curved line of letters and figures on a jig or similar work, it is generally a matter of guesswork whether or not the stamp is held exactly in the right position and, as a result, one letter or figure will be high or lopsided and the next will be faulty in some other respect. Sometimes the stamp will rebound and make a mark in the wrong place. Such a mark can be hammered out, providing it is not too deep. A good mechanic with a steady hand, a good eye and a new set of stamps can make a line of figures or letters that will be good enough, but when the stamps become worn and old, it is almost impossible to hold the stamp in the right position. I therefore designed the device shown in the sketch, which eliminates all these troubles.

It consists of a small block of steel, shaped as shown at A in the sketch. It has a square hole through the top, large enough to fit on the square bar B. This square bar has a square hole through the end in which to set the stamp C. The bar B is held firmly in position with a small setscrew through the top of the block A, as shown, and may be set at any desired distance from the edge of the work. The square hole in the end of the bar B acts as a guide for the stamps and should be filed out to fit the stamps snugly, yet so they will slip in easily. Each stamp is held at a uniform distance from the edge of the work and the face of the stamp will come flat upon the surface.

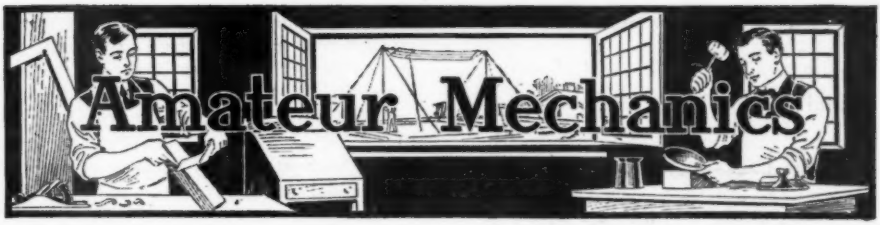
The lower portion of the block A should have a V-shaped notch cut into its inner side, so that it can be placed against the edge of a round surface,



Holder for Steel Letters for Use in Making a Uniform Straight Line of Words

and the curve of the letters forming the words will then be produced accurately.—Contributed by Chas. Homewood, Waterloo, Iowa.

¶A bronze paint for iron is made as follows: Grind together 2 lb. chrome green, 1 oz. ivory black, 1 oz. chrome yellow and 1 gill good japan. Thin with raw linseed oil.

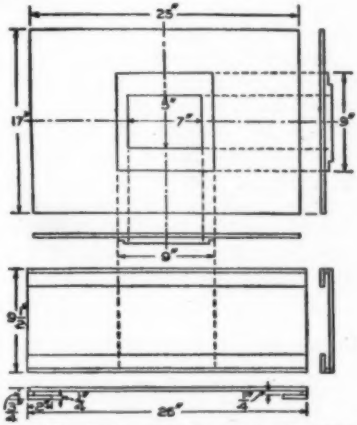


Multiplying Attachment for a Camera

By J. C. MOORE

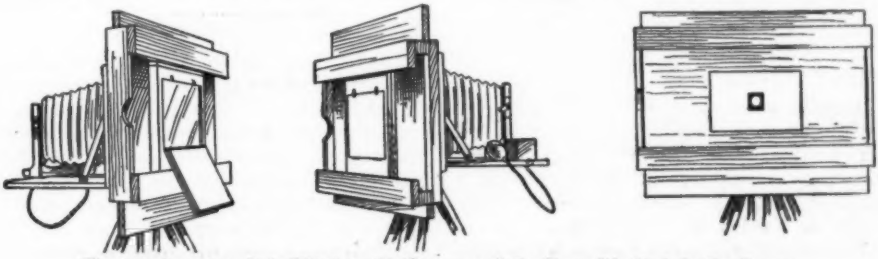
The hand camera suitable for this work is the kind commonly known as the reversible back, which is a detachable part that carries a ground glass for focusing and a place to insert the plate holders. When this part is removed, it will be seen that the back of the camera is mortised to prevent light from entering. Construct a frame to take the place of the back, but make it about 5/8 in. larger all around, and make one surface to fit the mortise of the camera box.

A back is now made and attached to the frame, to carry the ground-glass reversible back, so that it can be shifted over the center of focus for each small portion of the plate on which the picture is to be made. Measure the outside of the plate holder and, doubling the dimensions both ways, lay out a diagram on a piece of paper. Lay the plate holder on the paper and move it to the extreme left, then to the right, to see if the center of the plate will coincide with the center of the back. In the same manner locate the center in a vertical position. If the center lines do not coincide, increase the dimensions until this occurs. Mark, in the exact center, an opening the size of the plate and cut



Manner of Laying Out the Pattern for the Back and Locating the Exact Center

out the wood. It is best to use a three-ply wood for making the back, but if this cannot be obtained, procure a dry piece of wood and mortise and glue strips to the ends to keep the wood from warping. Glue the frame to this



The Attachment as It is Fitted to the Camera and the Reversible Back in the Frame

back, over the opening, and make attachments to hold it to the camera in the same manner as the reversible back was attached.

If pictures of two or three different sizes are to be made, the opening in the new back should be fitted with as many new pieces as there are sizes of pictures, each to have an opening of corresponding size. For a 5 by 7-in. plate, 1⅛ by 1¼-in. pictures is a good size, as there will be room for 24 pictures on the plate with a small margin left for notes. The piece to fill the opening should be made of the same material as the back so that a smooth joint will result. As a board cannot be made smooth enough for a perfectly light-tight joint, the surface on the new back, over which the reversible back travels, must be covered with cloth—a piece of black velvet is suitable—to exclude all light as the plate holder is shifted over the back.

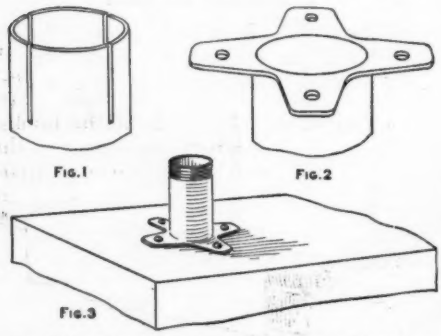
A frame is now made to carry the reversible back of the camera, the size of which will depend on the size of the other parts, as well as on the size of the camera to be used. This frame consists of two horizontal strips joined at the ends with grooved pieces, fitting the edge of the new back, so that it may be slid up and down in the grooves. The crosspieces are also rabbeted to receive the reversible back and allow it to be moved back and forth horizontally. The rabbet in the horizontal strips should not be so deep as to permit the extending edge to overlap the ground-glass frame, thus preventing it from moving back as the plate holder is inserted.

If the frame on the back and the reversible back fit tightly, they will remain in any position, but if they are loosely fitted, it will be necessary to provide some means to hold them. Small springs with pins may be fitted to the vertically moving frame to hold it in the position for the horizontal rows of pictures.

The ground glass should be marked for the size picture to be taken. The positions of the frame and plate carrier should also be marked so that the plate holder need not be taken out to find the location and focus for the next picture.

Connecting a Pipe to Sheet Metal

In the absence of a waste nut, an iron pipe can be easily fastened to sheet-metal work as shown in the sketch. The end of the pipe, Fig. 1, is slotted with a hacksaw to form four projections, which are turned outward and their ends rounded as shown in Fig. 2. The face of the projections are tinned and then riveted to the sheet-metal surface, as shown in Fig. 3. After soldering the joint, it will be as good or better than if a waste nut had been used.—Contributed by Lorin A. Brown, Washington, D. C.



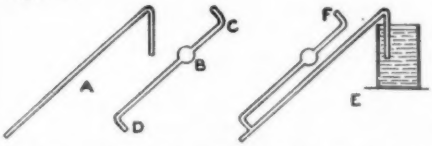
The End of the Pipe as It is Prepared to be Riveted on the Sheet Metal

An Acid Siphon

When siphoning off acids or other disagreeable or poisonous liquids, it is very important that none of it touch the flesh or mouth. It is almost impossible to do this when starting the ordinary siphon. A siphon that does away with this inconvenience and danger can be made as follows:

Procure a good Bunsen burner and two pieces of ¼-in. glass tube, one 2 ft. and the other 18 in. long. Heat the 2-ft. length at a point 8 in. from one end in the flame until it can be

bent as shown at A. The other piece should be plugged at one end and then slowly and evenly heated at a point 10 in. from one end. When the glass is soft, blow slowly and steadily into the open end, at the same time turning the tube around in the flame. This will form a bulb, B. The ends of the glass tube are heated and bent as shown, at C and D, and then fused onto the piece A, as shown at E. This can be accomplished by heating the piece A at a point 4 in. from the unbent end. When the glass becomes soft, place one end of a short piece of tube in it and pull out into a thread. Break this off as close to the tube as possible, to make a hole in the tube. Heat the end of the tube D and also the glass around the hole, and when both become soft, they can be fused together.



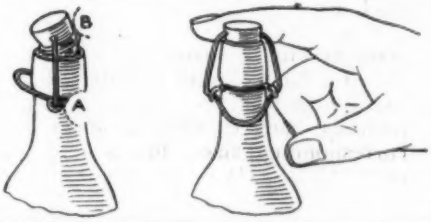
When Starting This Siphon It is Difficult for the Liquid to Touch the Mouth or Flesh

In use, close the end not in the liquid and, placing the mouth at F, exhaust the tube, thus filling it with the liquid. When the closed end is opened, the siphon will flow. The liquid collects in the bulb, and if a little care is used, none of it can reach the mouth.—Contributed by O. F. Tronnes, Evanston, Ill.

Bottle-Opening Trick

A local junk dealer, who was also known as the "strongest man in town," used to mystify the folks by opening a bottle, apparently with a stroke of his index finger. His audience saw his index finger strike the stopper, but did not see the knuckle of his second finger strike the eccentric at the point A, as shown in the sketch, causing it to fly up while his index finger B assisted the stopper out of the bottle mouth.

When trying the trick, it is best to select a bottle with a loose stopper, or else wear a glove, as the gentleman who demonstrated the trick had hands



In Striking the Bottle Cork, the Knuckle of the Second Finger Loosens the Wire Lock

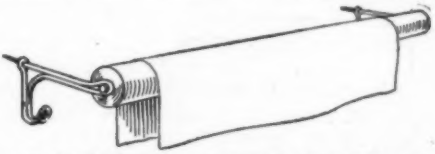
of the hard and horny type.—Contributed by James M. Kane, Doylestown, Pa.

Setting Colors in Fabrics

The colors of fabrics or other materials of any kind may be set by boiling the articles in the following solution: To 1 gal. of soft water add 1 oz. of ox gall. This solution should be boiling when the articles are dropped into it. A chemical reaction results and the colors are set or made nonfading. The process is harmless. Colors in wood may be treated in the same manner.

Towel-Roller Brackets

Very serviceable brackets for a towel roller can be made by using ordinary wire clothes hooks, as shown in the illustration. The roller is made of wood and two nails with their heads cut off, one in each end, form bearings to turn in the ends of the hooks. When it is desired to remove the roller, the hooks are sprung apart

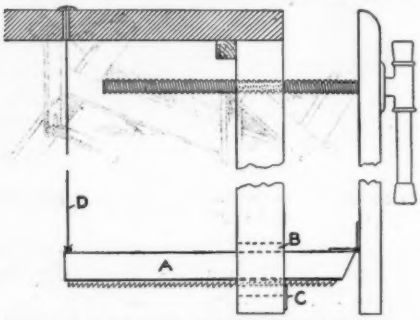


The Roller Brackets are Easily Adjusted in Any Location and Serve the Purpose Admirably

enough to allow it to drop out.—Contributed by Hugh Carmichael, West Lorne, Ont.

Attaching a Vise Jaw to a Bench

Procure a toothed metal rail or rack, A, such as is used for small ladder tracks, and mount it on the lower



The Rack on the Lower Guide Rail Provides a Means to Keep the Vise Jaws Parallel

edge of the guide rail for the lower end of the vise jaw. Provide a slot, B, in the leg of the bench, through which the rail can run with plenty of play room. A beveled plate, C, is attached to the face of the bench leg at the bottom of the slot, so that it will engage the teeth of the rack.

In use, when opening the vise by means of the screw, the rack will drag along the plate, and stop and engage a notch when the opening operation ceases. When it is desired to reduce the opening, it is only necessary to lift the rail by means of the string D. A button is tied to the upper end of the string on top of the bench, to keep it handy for changing the jaw.—Contributed by Harry F. Lowe, Washington, District of Columbia.

Removing Vegetable Stains

To remove stains of vegetables or fruits of any kind from cloth or wood, the following method is very good: The stained piece is first moistened with water and then placed in a jar or pail that can be covered. A lump of sulphur is ignited and dropped into the jar. Place the sulphur on a fire shovel when lighting it to avoid burns. The burning sulphur should be placed in the receptacle on the side where the stain will be exposed to the fumes. The sulphur burns slowly so that the articles will not be harmed.

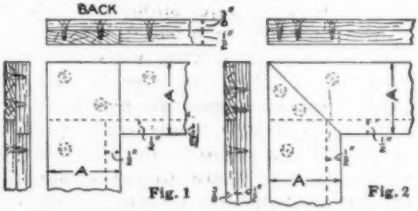
After the sulphur has burned away, the jar should be kept closed for a few minutes and when the articles are removed, the stains will be gone. This is harmless to try, and the cloth will not be injured if it is in a dry condition. The articles should be washed and dried as soon as they are taken out of the jar.

Picture-Frame Corner Joints

Very often the amateur craftsman comes across a picture which he would like to have framed, but the difficulty and insecurity of the ordinary miter joint for the corners discourage him from trying to make the frame. A very easy way to construct a rigid frame is shown in the illustration. The size of the frame must be determined by the picture to be framed. The width, A, of the pieces depends upon one's own taste.

Four pieces, the desired length and width and ½ in. thick, should be dressed out of the material intended for the frame. Four other pieces, ⅜ in. thick and ½ in. narrower than the first four pieces, are next made ready and fastened with glue and flat-head screws to the back of the first pieces, as shown. This allows ⅜ in. for glass, picture and backing, and ½ in. to lap over the front of the picture on all edges.

By arranging the pieces as shown in Fig. 1, a strong corner lap is secured.



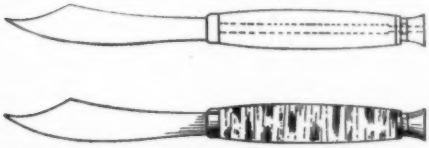
Square and Mitered Lap Joints for Making Rigid Picture Frames in Natural or Stained Woods

A miter lap joint which is not so strong is shown in Fig. 2. The latter gives a mitered-joint effect. This method does away with the use of the rabbeting

plane and miter box, both of which are difficult to use with accuracy. Two screws should be used in each joint to reinforce the glue.—Contributed by James Gaffney, Chicago, Ill.

Hunting-Knife Handles

Very artistic handles for hunting knives and carving sets can be made by using disks of horn. Procure some cowhorns from a slaughter house and split them with a saw, using only the large portion of the horn. The split horn is then heated by dry heat—an oven is best—then pressed between two cold plates to a flat piece. If well heated, it is surprising how easily this can be done. The piece is then cut into squares of suitable size which are marked and perforated in the center, the hole being a trifle smaller than the tang of the blade. The tang should



The Finished Handle, If the Work is Well Done, is Easily Mistaken for Agate

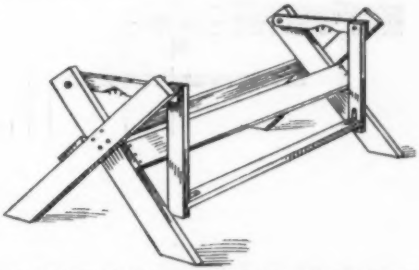
be flat and a little longer than the desired handle, with the end made round and threaded for a nut.

A suitable washer is placed on the tang, which is then heated sufficiently to burn its way through the pieces of horn as they are put on the metal. When a sufficient number of disks are on the tang a washer should be slipped on and followed by a round nut. Pressure is applied by turning the nut and repeated heatings of the disks will force them together to make perfect joints. Only a moderate pressure should be applied at a time.

The handle is now to be finished to the shape desired. If black and colored pieces of horn are interspersed, the finished handle will have the appearance of agate. The blade and handle can be lacquered and the ferrules nickelplated.—Contributed by James H. Beebee, Rochester, N. Y.

Holding Wood in a Sawbuck

Anyone who has used a sawbuck knows how inconvenient it is to have a stick roll or lift up as the saw blade

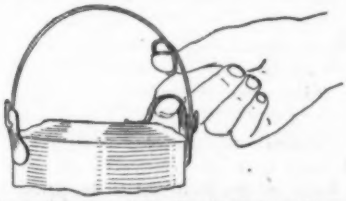


The Holding Attachment Easily Adjusts Itself to the Stick of Wood Placed in the Crotch

is pulled back for the next cut. With the supplementary device, shown in the sketch, which can be easily attached to the sawbuck, these troubles will be eliminated. It consists of two crosspieces hinged to the back uprights of the sawbuck and a foot-pressure stirrup fastened to their front ends as shown. Spikes are driven through the crosspieces so that their protruding ends will gouge into the stick of wood being sawed. The stirrup is easily thrown back for laying a piece of wood in the crotch.

A New Pail-Cover Handle

The handle of the cover, instead of being attached to the center, is placed near the edge and bail of the pail. On the bail and just above the handle of the cover there is formed a loop large enough to accommodate the thumb.

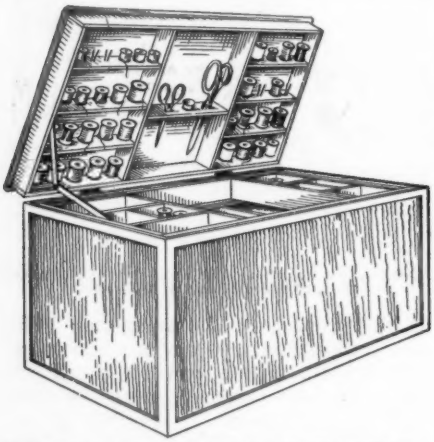


The Bail Loop and the Handle Make It Easy to Remove the Cover with One Hand

With this arrangement, the cover may be removed with the use of but one hand.

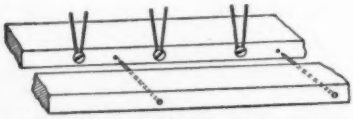
A Window-Seat Sewing Box

The combined window seat and sewing box shown was made by using a shoe-packing box for the foundation.



A Window-Seat Workbox for Sewing Materials, Made of an Ordinary Shoe-Packing Box

This was covered with matting and the edges and corners finished with wood strips, ½ in. thick and stained a dark red. Three trays were provided on the inside at the top part of the box, each of the two upper ones occupying one-fourth of the box opening and sliding on a pair of guides fastened to the sides of the box, while the lower tray is one-half the length of the box and slides on guides placed far enough below the upper trays to allow it to pass beneath these. The three trays were used for keeping sewing materials, such as buttons, hooks



The Spindles for the Spools are Made of Cotters Fastened with Screws in the Shelves

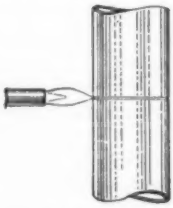
and eyes, etc. When the trays are all moved to one end it gives access to the lower part of the box where the work or mending is kept out of sight.

The inside of the cover is 1½ in. deep and shelves are arranged for thread and silk spools on either side, the center space being used for the shears, thimbles and scissors. The little shelves are made of two pieces, each half as wide as the depth of the box cover. The first half of the shelf is fastened in place, then a row of cotters attached with wood screws, whereupon the other half of the shelf is put in place. The edges of the cover are rounded on the outside to make an attractive seat.

While no dimensions are necessary, as the box can be of any size to suit the maker, it may be mentioned that the one shown is 28 in. long, 12 in. wide and 16 in. deep.—Contributed by R. B. Thomas, Lowell, Mass.

Cutting a Glass Bottle

It is sometimes necessary to cut a heavy glass bottle or cylinder. Four methods are in use. A carborundum disk having a thin edge, if kept wet and rotated at a high speed, will cut heavy glass, but the cylinder must be fed against the wheel very gently. A better way is to make a file mark — clean, but not very deep—around the cylinder and heat it with a long slender flame while slowly rotating the cylinder all the time. It is very important that the gas flame should not spread over the surface of the glass, for it is only the file mark that should be heated. A mere glancing touch is sufficient. Usually the glass will crack off in a very clean cut.



Sometimes a fine platinum wire is wound around in the file mark and heated by an electric current. Less common is the trick of wrapping a strand of yarn soaked in turpentine around the mark and burning it. The principle is the same in each case. The unequal heating of the glass causes it to break.—Contributed by Harry H. Holmes, Richmond, Ind.

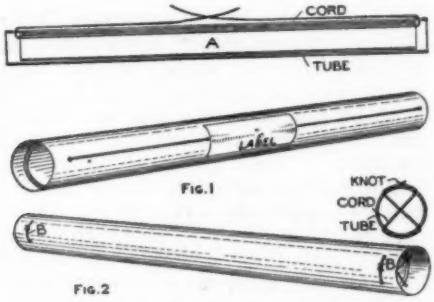
To Clean Painted or Frescoed Walls

Use a paste made of vinegar and baking soda with a small amount of salt added. The ingredients should be mixed in a large dish and applied to the wall with a cloth. The grease and fly specks as well as the carbon deposits from kitchen smoke are quickly removed. The mixture is harmless. After the wall is thoroughly cleaned, it should be washed with warm water and soap, then dried with a cloth. The mixture works equally well on enameled baths and glass or white porcelain.

Securing Papers in a Mailing Tube

The illustrations show two methods of securing papers or photographs in a mailing tube. In Fig. 1 the mailing tube A is shown in cross section and the manner of running the string through the pasteboard walls illustrated. The ends of the string are drawn up and tied over or under the label. If the label is pasted over the string or string ends as they are tied, it makes a sealed package which is rated as first-class matter.

The second way is to run the cords in a cross form through holes near the ends, as in Fig. 2, then tie the knots as at BB. In each instance,

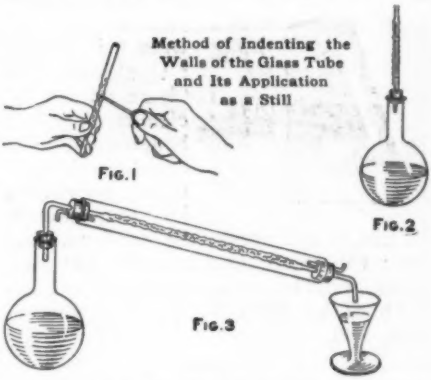


The String in Either Case Prevents the Papers from Slipping Out of the Mailing Tube

even if the papers fit the tube loosely, they will be held securely and can be easily extracted when the knots are untied.

Cooling Tube for a Laboratory Still

A simple and very effective device to replace the cumbersome cooling or condensation coil of a still for the



Method of Indenting the Walls of the Glass Tube and Its Application as a Still

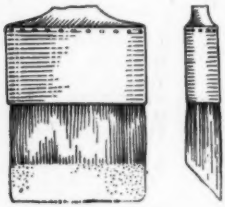
amateur's laboratory can be easily made as follows:

Procure an ordinary straight glass tube of fairly large diameter and heat it in the flame of an alcohol lamp with the use of a blowpipe or in a Bunsen burner with a very reduced flame so that only a small spot of the tube is brought to a red heat at one time. Then, with a previously pointed and charred stick of wood—a penholder, for instance—produce a small recess in the wall by pushing the charred end gently into the glowing part of the tube. This procedure is repeated until the whole tube is thus provided with small recesses. The indentations should be made in spiral lines around the tube, thus increasing the surface that is in contact with the cooling water. The operation of making the recesses is shown in Fig. 1. The walls of the recesses should have a regular and uniform slant.

The tube thus produced can either be used as a rectifier (Fig. 2) above a vessel, for fractional distillation, because it will allow the most volatile parts to pass out first, or as a condenser (Fig. 3), the arrangement of which needs no explanation. The amateur will find it much easier to make this tube than to coil a very long one.

A Comb Cleaner

A good comb cleaner that does the work easily and quickly can be made from a worn-out varnish brush. The brush selected should not be over 2 in. wide; it should be thoroughly cleaned with benzine and the bristles cut to a bevel, as shown in the sketch. In use, brush across the comb parallel with the teeth, and the dirt between them will be easily removed.—Contributed by John V. Loeffler, Evansville, Ind.

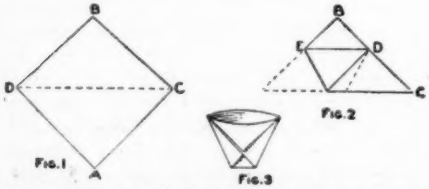


Scraping Off Surplus Water on a Grindstone

When using a grindstone, an ample flow of water is desirable in order to insure good cutting, and the objectionable spattering may be overcome by fastening a piece of leather to the grindstone frame so that its edge will bear lightly upon the stone just below the point where the work is held. This will scrape off all surplus water from the grinding surface and prevent spattering.—Contributed by Thos. L. Parker, Wibaux, Mont.

A Paper Drinking Cup

The cup is readily made of a piece of paper 8 in. square. Lay the paper on a flat surface, turn the point A over



Several Cups can be Nested Together and Carried in the Pocket or Hand Bag

to meet the point B and crease on the dotted line CD, Fig. 1, then turn the corner D up to meet the line BC, Fig. 2, making sure that the new edge DE is parallel with the lower edge and crease. Turn the corner C in the same manner, that is, fold it over to the point E and crease. Fold the two corners at B outward and down, and crease, and the cup is complete as shown in Fig. 3.—Contributed by W. Douglas Matthews, Chappaqua, New York.

Homemade Brush for Cleaning Upholstered Furniture

A durable brush for cleaning upholstered furniture can be made in the following manner: Procure a piece of haircloth, which is made of horsehair woof and linen warp. Strips of haircloth, cut lengthwise and 1¾ in. wide, are laid out smooth on a table and a strip of wrapping paper, ½ in. wide, is firmly glued to one edge. When this has dried, take out the warp that is not covered by the paper. Brush the fringe of horsehair until it is straight and even, and before com-

Brush Made of Strip of Upholsterers' Haircloth with the Warp Removed and Fastened to a Handle

mencing to wind, measure 6 in. from one end and glue this portion to the side of a strip of soft wood, 6 in. long, ⅝ in. wide and $\frac{1}{16}$ in. thick. When dry, wind the glued length of haircloth and paper around the wood strip, applying glue to each separate turn of winding. The turns should be kept flush on the side that has been glued and the fringed part brushed and straight.

The part to be glued to the handle must be perfectly even in its windings and held firmly in place while the glue is hardening. The winding should be continued until the brush is 1½ in. thick.

The handle is made of a piece of wood, 14 in. long, 1¾ in. wide and ½ in. thick. Wood that takes a cherry or mahogany stain is preferable. Shape it about as shown in the sketch and round off the edges. The part to

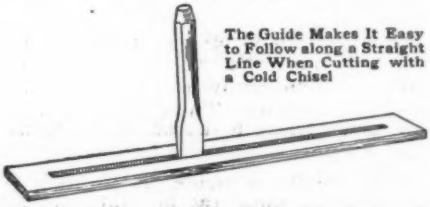
which the brush is to be attached must be given a light coat of glue. When that has dried, glue the back of the brush to it, and after the glue has hardened, glue a piece of gimp around the brush part, then drive upholsterers' tacks into the gimp and wood, ¾ in. apart. Stain and varnish the handle. The back of the handle can be used as a beater, and the brush for removing the dust.—Contributed by Gertrude M. Bender, Utica, N. Y.

Removing Calcium Deposits on Glass

A good way to clean glass vessels in which hard water is boiled is to use the following mixture to remove not only the calcium deposits, but also rust or sulphur stains that may be present. The solution is a mixture of ammonia water and a few ounces of salt. This should be placed in the glass vessel and boiled until the deposits disappear. The ammonia water may be made of any strength by diluting if necessary.

A Cold-Chisel Guide

When making long cuts with a cold chisel, it is almost impossible to guide the chisel edge along a line made with a scriber or pencil and have a straight cut. I find that it is much easier to use a guide, as shown in the sketch. The guide is made of a piece of wood, about 1 ft. long and 1½ in. wide. A slot is cut in the center, wide enough to receive the chisel edge snugly, and about 9 in. long. The guide is clamped

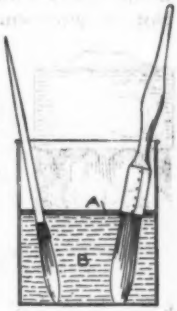


The Guide Makes It Easy to Follow along a Straight Line When Cutting with a Cold Chisel

to the work, and the cold chisel slipped along in the slot as it is successively hit with a hammer.—Contributed by G. H. Holter, Jasper, Minn.

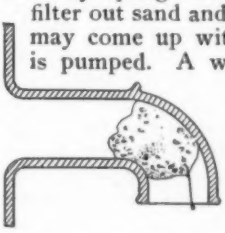
Care of Paintbrushes

When laying aside paintbrushes, the usual custom is to place them in water and then forget all about them until needed again, with the result that the water usually is found more or less evaporated and the brushes hardened. If a quantity of oil, A, is poured on the water B, it will prevent this evaporation and keep the brushes in good shape.



Filter in a Pump Spout

The sketch shows how to place an ordinary sponge in a pump spout, to filter out sand and dirt particles that may come up with the water as it is pumped. A wire is fastened in the sponge so that it can be easily taken out for washing. When washing the sponge give the pump handle a few strokes so that the dirt collected in the spout will be washed out. Do not press the sponge too tightly into the spout, as this will stop the flow of water.—Contributed by Chas. Homewood, Waterloo, Iowa.

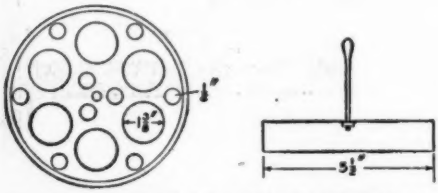


Brown Stain for Wood

Bichromate of potassium gives a lustrous, rich, light to dark brown stain on woods. The crystals are first dissolved into a saturated solution, which is then diluted with water. The stained surface needs no rubbing, as the stain leaves the wood perfectly clear for any desired finish. The satinlike appearance of wood treated by this stain cannot be produced with any of the pigment stains.—Contributed by August Meyer.

An Egg Boiler

In boiling eggs the usual method of dropping the eggs from a spoon into the boiling water often results in a



The Eggs are Prevented from Becoming Cracked and All are Easily Handled in One Operation

burn, as well as in cracking of the eggs by the fall. In removing the eggs from the hot water and taking one out at a time, no two will be cooked alike. To overcome these difficulties I constructed an egg boiler as illustrated.

A pan was procured—tin or aluminum as desired—about 1 in. deep and 5½ in. in diameter, and holes were drilled in the bottom having dimensions as shown. A handle was attached to the center with washers and nuts. The small ends of the eggs are set in the 1⅜-in. holes and the whole pan set in a vessel of boiling water. When the boiling is completed, the entire lot of eggs are removed at the same time. As the device with its load of cooked eggs is quite pleasing in appearance, it may be set on a plate and the eggs served from it on the table.—Contributed by W. E. Crane, Cleveland, O.

Removing Black Deposit on Bathtubs

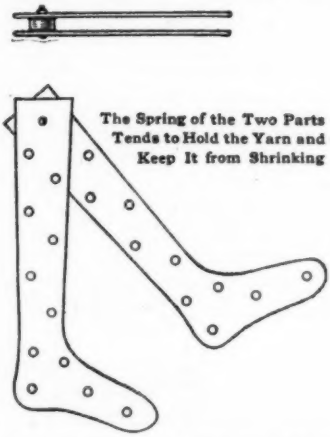
A good way to remove the black deposit left on bathtubs by the water is to use a strong solution of sulphuric acid. The acid should be poured on the discolored enameled surface and washed around with a cloth. The acid should not touch the hands so it is best to use a stick to move the cloth. Neither should it be allowed to touch the metal parts, but if this happens, no harm will result if it is quickly rubbed off with a cloth and water then applied.

In using this acid never pour water into the acid, but always pour the acid into the water.—Contributed by Loren Ward, Des Moines, Iowa.

A Stocking-Stretcher Form

A simple as well as inexpensive device for preventing the shrinking of stockings, more particularly those of children, after they have been washed, thus saving great wear and tear on the fabrics and increasing their length of life, is shown in the illustration. The stretcher can be made by anyone, a knowledge of woodcraft or art being unnecessary. If used, the device will prove to effect quite a saving in money, labor and worry in the course of a year.

Place a new and unused stocking, that properly fits the foot, flat on a heavy piece of cardboard or a wood board, if desired, and mark an outline of the stocking on the board with a pencil. Cut out the design with a penknife or heavy pair of scissors and smooth the edges. A design having

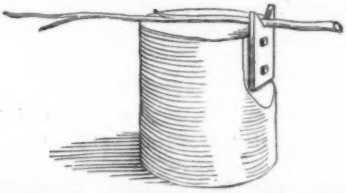


the same shape and size as the stocking results. Duplicate boards can be easily made. Place a spool, such as used to hold the finest silk thread, near the upper end of the first form and on top of this place the second. Then drive a nail through the boards and spool and clinch it, or better still, use

a small bolt. When the stockings are washed and the dampness wrung out as well as possible, stretch them over the boards and hang them up to dry. They will retain their shape and are easily ironed.—Contributed by Wm. P. Kennedy, Washington, D. C.

Stick Holder for a Chopping Block

Having a lot of branch wood, from ½ in. to 1 in. in diameter, to saw, and not wishing to bother with a sawbuck, I rigged up a chopping block, as shown in the sketch, by fastening a piece of board to one side of the block with



The Notched Board Fastened to the Chopping Block Turns It into a Sawbuck

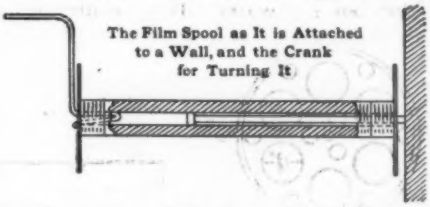
small lag screws. The piece to be sawed was laid across the block in the notch. If the piece is held down on the block with one foot, the wood is very easily sawn.—Contributed by Wilfred B. Sylvester, Reading, Mass.

Cleaning Gold and Platinum

A good way to clean gold or platinum jewelry is to first brush with soapsuds, then dust magnesia powder over the article and allow it to dry. A few rubs with a cloth makes the article shine with great luster. As magnesia powder is highly inflammable, it must be kept away from fire.

A Twine Spool

The pieces of twine used in tying parcels delivered to a residence are either thrown away or tied together and wound into a ball for future use. The method I use for keeping the pieces of twine is to wind them over a discarded photographic-film spool. The spool was slipped on a finishing nail driven into the wall. The crank for turning the spool was made of a piece of wire, bent as shown and slipped into the slot end of the spool. One end of the first piece of string was tied



The Film Spool as It is Attached to a Wall, and the Crank for Turning It

to the core and then wound around it, the next piece tied to the first and wound up, and so on, as the strings were taken from the packages from time to time. When a string is needed for any purpose I always know where to find it, and it is easier to take it from the spool than from a ball.—Contributed by W. Resseguie, Susquehanna, Pa.

Reinforcing Chair Bottoms

Embossed-leather-board chair bottoms can be made as serviceable as leather in the following manner: Turn the chair upside down and fill the hollow beneath the seat with excelsior, soft rags or fine shavings, then nail a ¼-in. wood bottom over the filling with brads. Make the wood bottom ½ or ¾ in. larger than the opening. It will thus not be seen, and the seat will last as long as the chair.—Contributed by J. H. Sanford, Pasadena, California.

A Novelty Chain

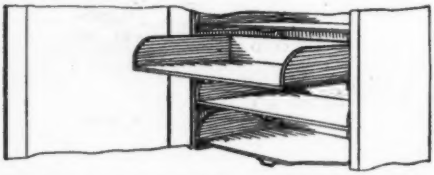
An inexpensive chain for hanging painted glass panels, transparencies or photographs can be made by joining paper clips together to form the links. A box of 100 clips will make a chain about 10 ft. long. Such a chain can be made in a few minutes and a length of 10 ft. will hold about 4 lb.

The Paper-Clip Links may be Joined to Make a Chain of Any Desired Length

If the chain is to be used for holding photographs, each inner loop end is bent out slightly.

Closet Holders for Linen

A combination drawer and shelf for a linen closet is much better than a shelf or a drawer. It is constructed in the manner of a drawer with sides



The Holder can be Pulled Out Like a Drawer and is as Accessible as a Shelf

and a back, the front being open and the ends of the sides cut rounding. A clip is attached to the under side of the bottom, near the front edge, to provide a means for pulling out the holder.

Sheets, towels, table cloths, napkins, etc., can be neatly piled on the holder and can be seen without digging down to the bottom. It has the advantage over the shelf that it can be pulled out without anything falling off, and the linen on the back part can be easily reached as well as that in front. The closet may contain as many holders as is necessary and should be provided with a door for keeping out dust.—Contributed by H. A. Sullwold, St. Paul, Minn.

Preserving Dry Batteries

The life of dry batteries, which are to be used in wet or damp places, may be considerably lengthened by being treated in the following manner:

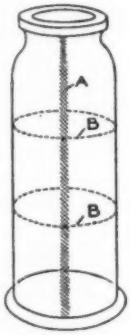
The batteries are placed in glass jars a little wider and higher than themselves. A layer of dry sawdust is placed in the bottom, for the battery to rest on, and the sides are packed with sawdust to within ½ in. of the top. Waterproof wires are connected to the binding posts and melted paraffin poured over the battery to the top of the jar. The carbon and zinc terminals should be marked to avoid trouble when connecting several cells together. Batteries treated in this manner are waterproof and can be submerged in water if necessary.—Contributed by Olaf Tronnes, Evanston, Ill.

A Cleaner for Brass

In some recent laboratory experiments the following solution was found to cleanse brass very quickly without harm to the hands or the metal. An ounce of alum was put into a pint of boiling water and the solution rubbed on the brass with a cloth. Stains as well as tarnish were quickly removed. The solution is inexpensive and easily prepared. — Contributed by Loren Ward, Des Moines, Iowa.

Homemade Graduate

If a certain quantity of liquid is to be frequently measured out, it is best to have a graduate marked for this amount without any other markings upon it. To make a graduate for this purpose, procure a pickle or olive bottle of the type shown in the drawing and file a vertical line, A, on each side. These lines should be at least ⅛ in. wide. Place the bottle on a level surface and pour in the amount desired to be measured. Mark on each vertical line with a lead pencil and connect this mark or marks with lines, filed as shown at BB.—Contributed by James M. Kane, Doylestown, Pa.



Mending a Break in Felt

A good way to mend partially broken felt or a felt hat is to hold a lighted match under the break and smooth out the crevice with the hand. The shellac in the felt is melted by the heat and runs together, mending the felt in such a way that the break is hardly noticeable. This method may also be used to mend felt articles in the laboratory.

PATENTS, PRACTICAL OR UNIQUE

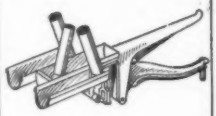


Fig. 1

HAIR CURLER (Fig. 1; British patent)—An unusual set of hair-curling tongs is here shown. The device has three troughs, the two outside ones sliding forward when the handles are brought together, so that the rods hinged to their inner ends force the hair against the rod in the stationary middle trough, thus producing a lateral wave of the hair.

Fig. 2

MAGAZINE FOR PHONOGRAPH RECORDS (Fig. 2)—This shows a booklike magazine for carrying phonograph records of the disk type. The pages of the book, which is of the loose-leaf type, are in the form of envelopes into which the disks are slipped.

NEW METAL CAP FOR BEVERAGE BOTTLES (Fig. 3)—The ordinary metal cap, now almost universally used for beer bottles and bottles containing soft beverages, is not as satisfactory as it might be because an opener is required. The latest metal cap of this kind, however, has a tab which, when pulled, tears the cap across the center, thus making its removal very simple.

Fig. 3

TRACTION SHOE FOR AUTOMOBILE TIRES (Fig. 4)—This is a detachable traction shoe for automobile tires, designed particularly for use when the machine sticks in mud or sand.

A TOOTHED NUTCRACKER (Fig. 5; British patent)—This nutcracker differs from the usual kind in that only one jaw is provided with a file surface, the other having pointed teeth.

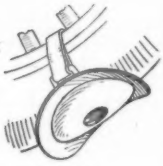


Fig. 4

DETACHABLE HEEL PLATE (Fig. 6)—Although this device might be thought at first glance to be a horseshoe, it is, in reality, a detachable heel plate for the ordinary walking shoe. The pawls, pivotally attached to the three uprights, have points intended to engage the seam of the heel of the shoe, these points being held securely in the seam by springs.

A WALKING TRACTOR (Fig. 7)—The accompanying illustration clearly shows the interesting feature of this tractor. It walks instead of rolls, having four legs shod with disks.

Fig. 5

SEED REMOVER (Fig. 8)—This seed-removing spiral is forced downward into an orange or similar fruit without turning the handle. By then rotating the handle, the seeds are removed.

ROLLER SWITCH FOR RAILWAYS (Fig. 9; British patent)—A railway switch of a new type is here shown. It is a roller switch, the main rail being formed with a longitudinal tapering recess in which a cylindrical stub switch is adapted to rotate, so as to bring the corresponding switch members into engagement with the main rail.

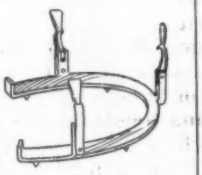


Fig. 6

FOLDING LEG BRACKET (Fig. 10)—This leg bracket, designed to carry the weight of receptacles, such as baskets, pails, and the like, has a carrying arm which may be folded out of the way when not in use.

SIGHTING DEVICE FOR AEROPLANES (Fig. 11; British patent)—This sighting device is designed for use in connection with bomb-dropping apparatus on aeroplanes. A camera or view box contains a ground-glass screen onto which a picture of the ground is projected by a telescope and reflector. This view box, which is shown in the lower left-hand corner of the diagram, is automatically tilted in accordance with the speed of the aeroplane. This automatic operation is by means of a centrifugal governor which is actuated by wind cups or vanes and controlled by a spring. Horizontal lines on the screen correspond to various heights of the machine above the earth.

SMOKE AND CINDER CONDUCTOR FOR LOCOMOTIVES (Fig. 12)—Out of Cripple Creek, Colo., comes this smoke and cinder conductor for locomotives. The conductor discharges under the running board of the locomotive.

Fig. 7

Fig. 8

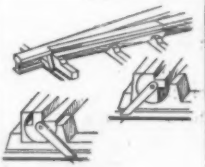


Fig. 9

Fig. 10

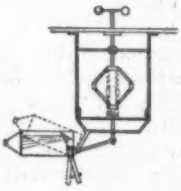


Fig. 11

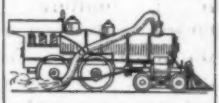


Fig. 12

NO want him," said the Indian, pushing back the ticket through the window, "cost too much."

"Oh, I see," mused the ticket agent, "the influence of heredity is strong within you. You probably want a scalper's ticket."—Railroad Men.

"All new arrivals are washed," explained the governor of the prison.

"And if they make a fuss?"

"Then they are ironed."

From a city apartment little Jack was going for the first time to spend Christmas at his grandfather's farm. As he ran up the steps of the old house his grandmother caught him up in her arms and put him down, rosy and laughing, before the great log fire in the living room.

"Isn't that fine, Jackie, boy?" she said. "You don't have big log fires like that in New York, do you?"

The boy looked with wide-eyed delight at the huge logs as they blazed and crackled in the generous old fireplace, but he was stanchly loyal to his "six rooms and bath."

"It's nice, grandma, but it's only an imitation gas log, isn't it? We have real ones in my house."—Lippincott's.

Nervous Passenger—For heaven's sake, put the brakes on! We shall run into something!

Speed Hog (airily)—I never touch the brakes till the lamps begin to buckle!—The Motor.

An Arab went to his neighbor and said, "Lend me your rope."

"I can't," said the neighbor.

"Why can't you?"

"Because I want to use the rope myself."

"For what purpose?" the other persisted.

"I want to tie up five cubic feet of water with it."

"How on earth," sneered the would-be borrower, "can you tie up water with a rope?"

"My friend," said the neighbor, "Allah is great and he permits us to do strange things with a rope when we don't want to lend it."—Boston Transcript.

"Muz, did you hear the stepladder when it tumbled over?" Mother (not rising from her lounge)—"No, darling, I hope papa didn't fall." "Not yet; he's still hanging on to the picture molding."—Life.

"I call the people who run this boarding house a regular cutlery family."

"How so?"

"Well, the daughter spoons, the father forks out the money, and the mother knifes the guests who ask for a second helping."—London Opinion.

"Mary," he said, "I have just received notice from the man who holds the mortgage on our house that the interest is about due again. I'm afraid we'll have to give up our automobile."

"Why, John?"

"To raise the interest money on the house."

"What's the matter? Can't we get enough for our interest in the house to keep up the payments on the automobile?"—Chicago Record-Herald.

An admiring constituent gave Congressman Legare of South Carolina one of those vest-pocket-edition Lilliputian Mexican dogs to take home to the children. Legare—pronounced Leg-ree, by the way—was leading the dog along by a cotton string when a South Carolina mountaineer stopped him.

"Are it a regular dog?" the man asked.

"Yes, it's a Ch—. Well, I can't pronounce the name of it," said Legare, "but it's some kind of a Mexican dog."

"Just a pup, I reckon."

"No, it's full grown."

"Well," opined the mountaineer, "that's the least dog I ever seen at one time."—Telegraph.

"I have always been interested," said little Jinks, "in the valuation of waste. Now, where do you suppose all these burst tires go to in the end?"

"I don't know," said the genial philosopher, "but if they go where most people consign 'em there must be a terrible smell of rubber in the hereafter."—Tit-Bits.

First Chauffeur—Did the guy you ran over give you a tip for taking him to the hospital?

Second Chauffeur—He did not! The next time I run over him he'll know it!—Puck.

A customer in a butcher's shop stood gazing at some small alligators in an aquarium. Having turned the matter over in his mind, the customer approached the butcher and exclaimed, "I suppose a body might as well be dead as out of style. Give me a couple of pounds of alligator."—Argonaut.

Fair Maid—I wonder what causes the flight of time?

Brilliant Young Man—It is probably urged on by the spur of the moment.

Last night, after I'd caught the soap for the second time in the bath tub, there came an insistent ring on the telephone, I was alone in the house, and as I was expecting an important telegram I dashed for the telephone in a cloud of silver spray. When I picked up the receiver all I got was: "Sorry; I rung you by mistake." Says I, "You didn't wring me at all; I'm still dripping."—Chicago Tribune.

"Did you know," bawled the Reform Orator, "that the macadamized roads made by the trusty inmates of the Canon City, Col., State prison, under a reform administration and humane methods, are the smoothest and firmest in the world?"

"No," said a quiet voice in the audience; "but we've always been taught that the way of the transgressor is hard."—Judge.

First Jeweler—I have had proved to me that advertising brings results.

Second Jeweler—How?

First Jeweler—Yesterday evening I advertised for a watchman, and during the night my shop was ransacked by burglars.—Penny Pictorial.

Mrs. Nayber—Mrs. Codfish says her husband presented her with a horse and trap for her birthday.

Mr. N.—Huh! I'll bet it was a clothes-horse and a mouse-trap.

All These FREE!

YOUR paint or hardware dealer will give you for free trial two 10c bottles of Johnson's Wood Dye—one 10c can of Prepared Wax and 25c Instruction Book, Edition P.A. 2, "The Proper Treatment for Floors, Woodwork and Furniture." If your dealer cannot supply you send coupon to us and we will send all to you free and postpaid.

Johnson's Wood Dye

Comes in 17 popular shades: Mission Fumed Oak, Mahogany, Early English, etc. This is really a dye, not a stain. It makes no change in the wood—does not raise the grain or otherwise alter it except to freshen and restore lost beauty, and to color it to suit your decorations. It is particularly well adapted to new wood and produces the same perfect results as in refinishing.

Johnson's Prepared Wax

adds a finishing touch like velvet—soft and rich, without that "shiny" look. The Free Book tells how to apply it over any woodwork, new or old to give a lasting and lustrous polish. Get book and 10c packages today. If your dealer is not supplied, write us.

S. C. JOHNSON & SON

"The Wood Finishing Authorities" **RACINE, WIS.**

55c COUPON

S. C. Johnson & Son
Racine, Wis.

I accept offer under your conditions — one 10c can of Prepared Wax and two 10c Bottles of Johnson's Wood Dye, and 25c book Edition P. A. 2 **FREE.**

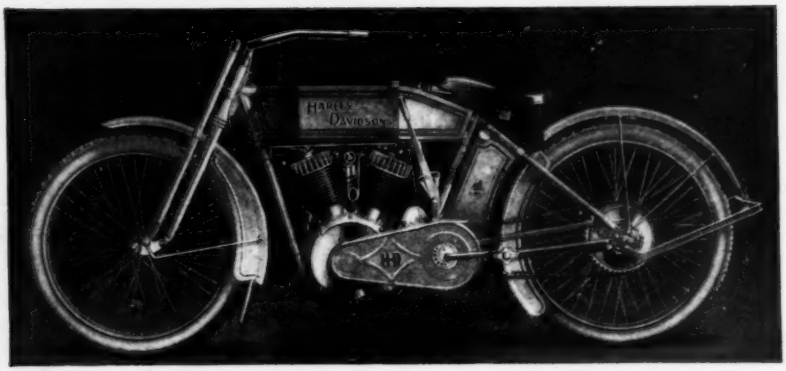
Shades Nos.....

Name.....

Address.....

City..... State.....

HARLEY-DAVIDSON



The Greatest Harley-Davidson

Eight Honest Horsepower.

THE new Harley-Davidson Twin Cylinder does not have to be babied, nursed or coaxed into action—it is ALL THERE. It is instantaneously responsive to the throttle—off like a flash—picks up quickly—no hesitation—no sluggishness—no snorting or popping. This new

HARLEY-DAVIDSON

without question is the fastest machine on the road today. Its exceptional speed has been obtained in a measure through the use of large intake and exhaust chambers and passages, and pistons, connecting rods and fly wheels individually and collectively in perfect balance. And this speed comes without sacrificing one atom of Harley-Davidson reliability or endurance, In fact the decreased vibration, due to more perfect balance of the vital parts has actually increased the life of the motor

The Ful-Floteing Seat which does away with all jolts and jars due to rough roads, and the Free-Wheel Control, a device which permits starting without the usual hard pedaling or running alongside are incorporated in all models.

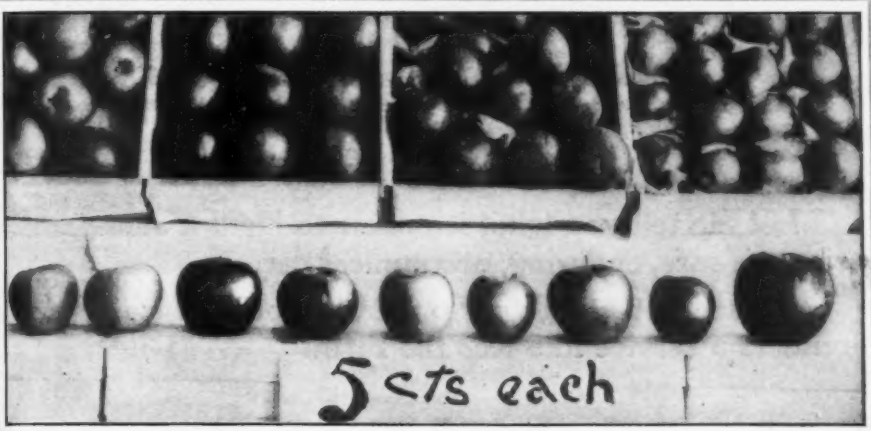
Both of these features are patented and are to be found only on the Harley-Davidson.

Telephone our dealer for a demonstration or send for literature.

HARLEY-DAVIDSON MOTOR CO.

Producers of High Grade Motorcycles for eleven years.

287 B STREET MILWAUKEE, WIS.



Which Would You Choose?

IF YOU saw a row of apples, every one differing in size, ripeness and color, and all for sale at the same price, wouldn't you choose the best? Why not do the same thing when you buy fire insurance? The cost of insurance is substantially the same in all companies, but what you get for your money varies as much as the apples in this row.

Choose the **Hartford Fire Insurance Company.** For over 100 years it has paid every honest loss, big and little. Its reputation is unexcelled. It is the best fire insurance apple of them all, and its policies cost no more than those of inferior quality.

Why not use the same good judgment in buying insurance that you do in buying goods for your store, clothes for your family, or even in such a trivial matter as buying apples from the fruit stand? And the next time you insure,

INSIST on the HARTFORD

Agents Everywhere

What Conscience Costs

By R. E. Olds, Designer

Let me tell you what it means to build a conscientious car. A safe, enduring, economical car.

A car that stands up under use and abuse, and that renders a service like Reo the Fifth.

Externals

Cars, like houses, may be largely built for show. The main attention may be given externals.

Such cars for a time seem to be most successful. But the ups and downs of Motordom show how inevitable is the reaction.

On the other hand, the man who builds Reo the Fifth today has built cars for 26 years. The demand for his cars is far larger than ever. Last spring it ran five times the factory output.

Such extended prestige is unique in this industry. And every man knows it is solely due to such principles as these.

Hidden Things

Our chiefest attention is given things which don't show. Yet you can easily see that we neglect no external.

All steel is made to our formulas, based on vast experience. And each lot is analyzed twice, before and after treating. Whatever falls short is discarded.

Each important part, by actual test, is made very much stronger than necessary. No margin of safety is less than 50 per cent.

A crushing machine tests gear teeth for 75,000 pounds. Another machine tests springs for 100,000 vibrations.

Engines are tested 20 hours on blocks and 28 hours in the chassis. There are five long-continued tests.

Each car gets a thousand tests and inspections, so errors can't occur.

Costly Extremes

In this car we employ 190 drop forgings. Steel castings would cost half as much. But drop forgings can't have flaws.

We use 15 roller bearings —Timken and Hyatt. Common ball bearings cost one-fifth as much, but they too often break.

We use a $75 magneto. We doubly heat our carburetor. And we add $100,000 per year to our cost to insure positive water circulation.

Parts are ground over and over to insure utter exactness. We don't run nights. And we limit our output to 50 cars daily so men are never hurried.

Then note the big tires—34x4. They cost almost twice as much as tires which some men deem sufficient. But the difference comes back, again and again, in the cost of your tire upkeep.

$2,000,000 for Extremes

We spend in these ways about $2,000,000 per year more than we need to spend. It is made up largely by factory efficiency—by making all our own parts—by building only one model.

The rest we make up by reducing our profit to the lowest possible minimum.

The result is a car built as we describe—built like the costliest cars on the market—for $1,095.

The result to you is freedom from trouble, immense endurance and small cost of upkeep. It means a lifetime car.

Men who know now look for such a car. And I pledge them my word that, so long as I build it, they will get it in Reo the Fifth.

Reo Center Control

This car alone has what experts consider the ideal center control.

All the gear shifting is done by moving a small handle only three inches in each of four directions. It is done with the right hand—done as easily and naturally as moving the spark lever.

No side lever, nothing in the way. Both brakes are operated by foot pedals. And the driver sits on the left hand side as in the finest modern cars.

The bodies are finished with 17 coats. The deep upholstering is of genuine leather, filled with the best curled hair.

Three electric lights, with the dashboard lights set in. You find in this car every final touch as in cars at twice the price.

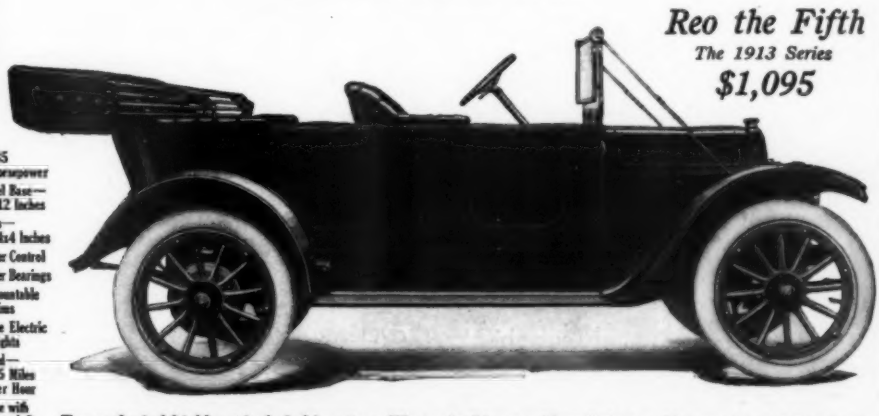
If another such car sells at such a price, I never yet have found it.

Sold by a thousand dealers. Write for our 1913 catalog and we'll direct you to the nearest one.

R. M. Owen & Co. General Sales Agents for **Reo Motor Car Co., Lansing, Mich.**

Canadian Factory, St. Catharines, Ont.

Reo the Fifth
The 1913 Series
$1,095



30-35 Horsepower
Wheel Base—112 Inches
Tires—34x4 Inches
Center Control
Roller Bearings
Demountable Rims
Three Electric Lights
Speed—45 Miles per Hour
Made with 5 and 2 Passenger Bodies

Top and windshield not included in price. We equip this car with mohair top, side curtains and slip cover, windshield, gas tank for headlights, speedometer, self-starter, extra rim and brackets—all for $100 extra (list price $170).

No-Rim-Cut Tires

One Glance Tells You

1—That This Tire Can't Rim-Cut

There are no hooks on the base, as with clincher tires.

The tire is held on by our patented feature—by six flat bands of 126 braided wires, vulcanized into the tire base. That makes the tire base unstretchable.

So your removable rim flanges are set to curve *outward*, not *inward*, as with old-type tires.

And the tire, when wholly or partly deflated, rests on a rounded edge.

2—That This Tire Can't Skid

These deep-cut, sharp-cut blocks present to the road surface countless edges and angles, facing every direction. They give a bulldog grip.

The tread is double-thick, and the extra tread is of very tough rubber. So the non-skid feature lasts.

The blocks meet at the base, so the strains are distributed over the fabric the same as with smooth-tread tires. That Goodyear feature immensely increases the life of a non-skid tire.

3—That This Tire Is Oversize

We say 10 per cent oversize. But careful comparison with six makes of clinchers shows the actual oversize, in air capacity, to be 16.7 per cent.

Even 10 per cent oversize, under average conditions, adds 25 per cent to the tire mileage. It takes care of your extras. It saves the blow-outs due to overloading.

No need to take anyone's word for these things. One glance at these tires, at any Goodyear shop, will prove them in a moment.

10% Oversize

Users Will Tell You They Save 48%

250,000 Know

Not less than 250,000 motorists now use Goodyear tires.

They have tested out about two million tires. And, in these days of odometers, they don't guess at results.

These facts tell the verdict:

Goodyear tires now far outsell every other tire.

Last year's sales by far exceeded our previous twelve years put together. Yet the demand exceeded our output by some 400,000 tires.

As per contracts now made, nearly half of this year's new cars will go out with Goodyear equipment.

Average Savings

On the same car, under the same conditions, the average saving through No-Rim-Cut tires is about 48 per cent.

On some cars and on some roads this means enormous mileage. On other cars which are under-tired the mileage will be less.

But the average saving, as compared with old-type tires, doesn't greatly vary.

No-Rim-Cut Tires save every penny that rim-cutting costs.

Their 10 per cent oversize, by increasing the mileage, saves 25 per cent.

On Non-Skid tires the saving is larger. Because our inventors, in ways described, have added immensely to the life of non-skids.

How to Prove It

The way to prove it is to make a comparison, as hundreds of thousands have done.

Our sales figures tell you what their judgment has been. And your own eyes can see the apparent advantages.

Figure what it would mean if these tires do save you 48 per cent. Is it not worth proving out?

For thirteen years we have held the belief that the tire which gave the greatest service would become the favorite tire.

We have seen the time when Goodyears held only one per cent of the tire trade.

We have seen the demand take enormous strides, until this tire outsold all.

Now, for your own sake, we ask your comparison. And we shall accept your verdict.

Write for the Goodyear Tire Book—14th year edition. It tells every known way to save tires.

GOODYEAR
AKRON, OHIO

No-Rim-Cut Tires

With or Without Non-Skid Treads

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO

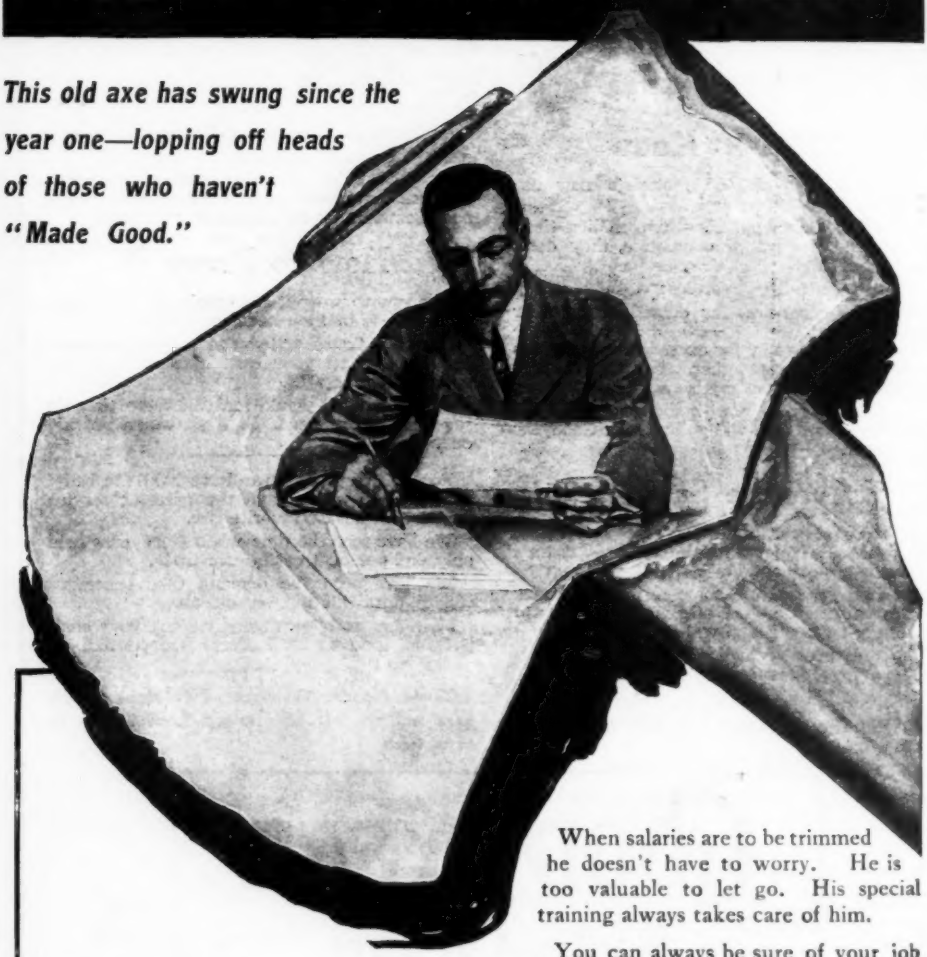
Branches and Agencies in 103 Principal Cities **More Service Stations Than Any Other Tire**

We Make All Kinds of Rubber Tires, Tire Accessories and Repair Outfits

Main Canadian Office, Toronto, Ont.—Canadian Factory, Bowmanville, Ont. (956)

The *Trained* Man

This old axe has swung since the year one—lopping off heads of those who haven't "Made Good."



When salaries are to be trimmed he doesn't have to worry. He is too valuable to let go. His special training always takes care of him.

The Man who holds his job when others "get the axe" is the man who can use his head as well as his hands. When promotions are to be made, he is the first on the list.

You can always be sure of your job and sure of your future if you have ***special training*** such as the International Correspondence Schools can impart to you in your ***spare time.*** Perhaps you want to advance still further in your present position. Possibly you have a liking for some other line of work. One thing ***is*** sure—

Dodges the Axe

you want to ***earn more***—don't you? Then mark and mail the attached coupon and learn how the I. C. S. can help you, regardless of your age, address, occupation, limited schooling, small salary, lack of spare time, or any other seeming obstacle.

RAISES YOUR SALARY

For twenty-one years the business of the I. C. S. has been to raise salaries of poorly-paid but ambitious men. That the I. C. S. ***does*** raise salaries is shown by the 400 or more ***VOLUNTARY*** letters received every month telling of salaries raised and positions bettered ***as the direct result of I. C. S. help.***

When you consider that it costs you nothing to mark the coupon to learn ***how*** the I. C. S. can help you, and that doing so places you under no obligation, is there any reason why you shouldn't mark it ***NOW?*** If your doubt is stronger than your ambition you will imagine a hundred-and-one objections. The I. C. S. has already overcome each and every one of these same objections for thousands of men who have since had their salaries raised and their positions bettered through I. C. S. training imparted ***at home and in spare time.***

BETTERS YOUR POSITION

You don't have to leave home, stop work, or lock yourself in your room every night. An I. C. S. training imposes no financial hardship, for the I. C. S. arranges its easy terms to suit ***you.*** So long as you can ***read and write*** that is all the schooling you need. Marking the coupon costs nothing and involves no obligation. Then since it is all so easy, and the I. C. S. way is so perfectly adapted to meet ***your*** particular needs, mark and mail the attached coupon ***NOW.***

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 872, SCRANTON, PA.
Explain, without further obligation on my part, how I can qualify for the position before which I mark X.

Salesmanship	Civil Service
Electrical Engineer	Railway Mail Clerk
Elec. Lighting Supt.	Bookkeeping
Electric Car Running	Stenography & Typewriting
Electric Wireman	Window Trimming
Telephone Expert	Show Card Writing
Architect	Lettering & Sign Painting
Building Contractor	Advertising
Architectural Draftsman	Commercial Illustrating
Structural Engineer	Industrial Designing
Concrete Construction	Commercial Law
Mechan. Engineer	Automobile Running
Mechanical Draftsman	Teacher
Refrigeration Engineer	English Branches
Civil Engineer	Good English for Every One
Surveyor	Agriculture
Mine Superintendent	Poultry Farming
Metal Mining	Plumbing & Steam Fitting
Locomotive Fireman & Eng.	Sheet Metal Worker
Stationary Engineer	Navigation — Spanish
Textile Manufacturing	Languages — French
Gas Engines	Chemist — German

Name _____

Present Occupation _____

Street and No. _____

City _____ State _____

Always on Guard

No matter where a ship may be along the American coast; no matter how dark, or cold, or stormy the night, the coast guard is on watch, patrolling the nearest beach or rocky cliffs.

This man, always on guard, could, by his own unsupported efforts, do little to save life, or to guide ships away from perilous points.

As a unit in an efficient system and able, at a moment's notice, to command the service of his nearby station, he becomes a power to whom all ship owners and passengers are indebted.

In the same way, the Bell Telephone in your home and office is always on guard.

By itself, it is only an ingenious instrument; but as a vital unit in the Bell System, which links together seven million other telephones in all parts of this country, that single telephone instrument becomes a power to help you at any moment of any hour, day or night.

It costs unwearying effort and millions of dollars to keep the Bell System always on guard, but this is the only kind of service that can adequately take care of the social and commercial needs of all the people of a Nation.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

Every Bell Telephone is the Center of the System.

Please Mention Popular Mechanics

SPEAR Will Trust You Wherever You Live—Write For His Catalog—I'ts Free

A Personal Word

The rich and prosperous class can always command the luxuries of life, but the average home lover needs the Spear System of Credit to the Nation. I want 1,000,000 families to say of me: "He helped us to furnish and beautify our homes." I ask for no higher tribute to my life's work.

Write for my Big Free Catalog today.

SPEAR of Pittsburgh

World's Greatest Home Furnisher

Spear of Pittsburgh sells Home Furnishings to hundreds of thousands of Home Lovers all over the land. In the high quality of his goods, the fair square treatment extended to his vast army of customers, and his exceptionally liberal credit terms, **Spear** can justly claim to be the World's Greatest Home Furnisher. Under his plan, **Spear** has made it possible for families of the most moderate means to have all the comforts, necessities and luxuries formerly found only in the homes of the rich and prosperous classes. **Spear** is the originator of the Divided Payment Plan of Home Furnishing. He learned the needs of the people by many years personal experience conducting a chain of retail stores.

So Easy To Trade With Spear

Simply send for the **Big Free Spear Bargain Catalog**, which brings an enormous stock of Home Furnishings—many times the size of even the greatest city store—right to your home. **Spear** shows you everything for the home, including a marvelously attractive assortment of carpets, rugs and draperies in the colors, patterns and designs photographed from the original goods. **Spear's Bargain Catalog** shows—

Furniture,	**Ranges,**	**Sewing Machines,**	**Mattresses,**
Carpets,	**Refrigerators,**	**Washing Machines,**	**Springs, Bedding,**
Rugs,	**Clocks,**	**Lace Curtains,**	**Silverware,**
Stoves,	**Dishes,**	**Portieres,**	**Go-Carts.**

Spear Will Gladly Trust You

Spear of Pittsburgh trusts the people and the people trust **Spear.** He has full confidence in the readers of this paper, and invites them to accept his liberal, open account, long time credit, divided payment plan. Why should you buy home furnishings from any one but **Spear,** when he gives you the greatest selection of high grade goods, at lowest prices, and makes it so easy for you to pay?

Spear Offers 30 Days Free Test

Anything you order from **Spear of Pittsburgh** will be shipped with privilege of 30 days' free home trial before sale is considered finally closed. **Spear** has the right idea—he thinks that his goods should sell themselves after you know exactly what they are by actual test. Isn't that the fairest way to do business?

Just Try The Spear Way Once

Spear of Pittsburgh probably has a larger percentage of satisfied customers—home lovers who buy of him year after year—than any other house. And every one of these regular customers began with a trial order that proved satisfactory. No competitor can take these customers away from **Spear** because they're satisfied and that settles it. That is the reason **Spear** puts so much stress on getting your first order.

Newest "Auto" Collapsible Go-Cart

No. C 133. Price $9.45, $1.50 Cash, 75c Monthly

Full Collapsible Go-Cart with enameled flat steel frame and heavy round tubular steel pushers. Enameled cross handle and nickel plated side arm and dash trimmings. 10 in. wheels with heavy solid rubber tires. Has long reclining upholstered back, adjustable foot basket and long flat springs under seat, automobile four-bow extension hood with full curtain, sides and back. Cover is of best black leatherette.

Rug Bargain

A high color Brussels Rug, red rose design with either green or tan ground. Splendid value.

No. C. W. 4602
9x12 size
Price $11.95
$1.50 Cash.
75c per Mo

New Queen Kitchen Cabinet

No. C 2850. Price $9.95 $1.50 Cash, 75c Month. Made of solid oak, high gloss finish, has china cupboards, spice drawers, sugar bin, spice cans, flour bin and cutlery drawers. Size, 47 inches wide; 25 inches deep; 70 inches high. Doors fitted with fancy art glass.

Order No. C. W. 611—Price, $4.95—75c Cash, Balance 50c Monthly.

Rocker Bargain

A large, comfortable solid golden oak Rocker with high back, fully tufted and buttoned. Upholstered with high grade black Sylvan leather. Full steel springs with beautiful ruffled edge to match back. Wide arms, front posts of handsome design.

Colonial Library Table

No. C. W. 3774—$8.95 $1.50 Cash—75c per Month.

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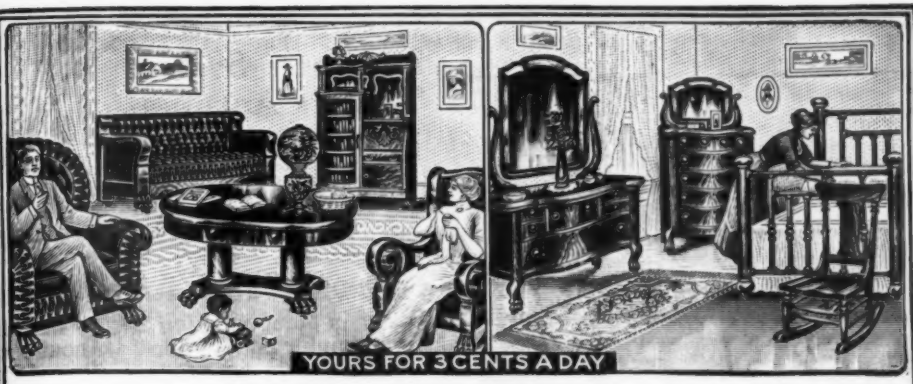

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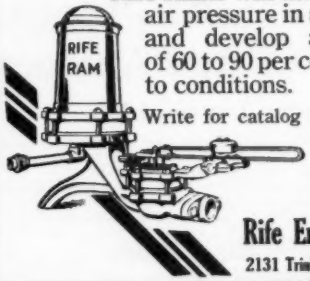

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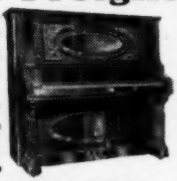

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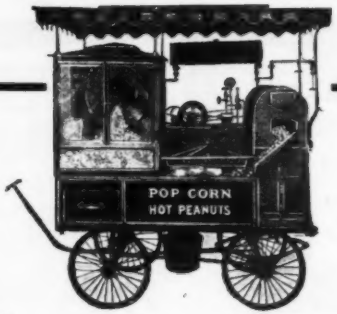

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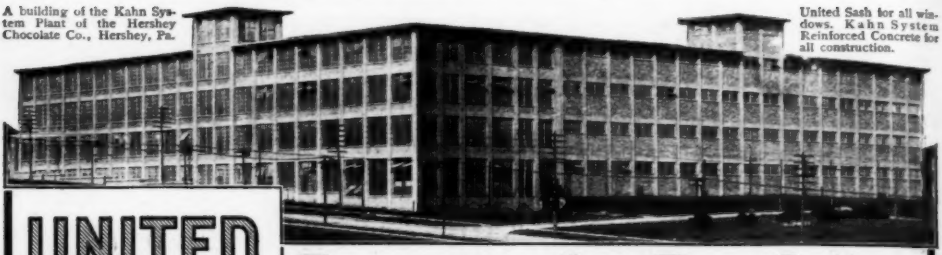

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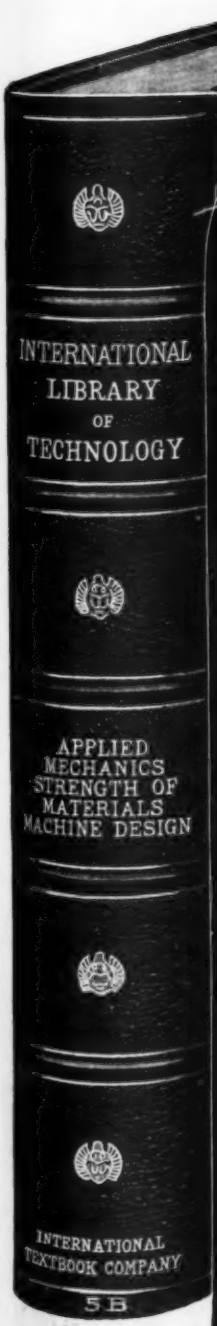

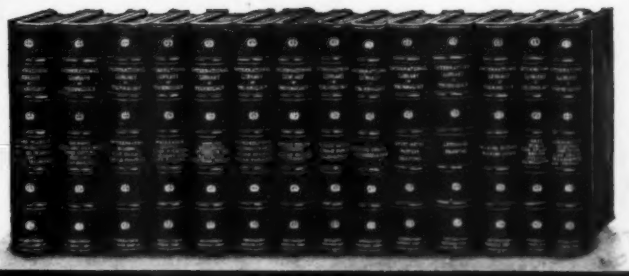

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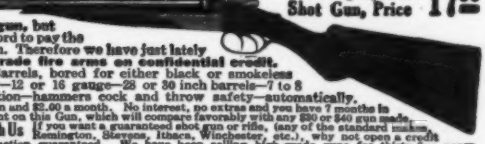

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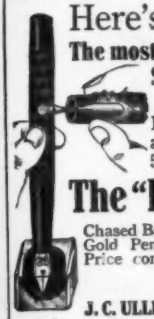

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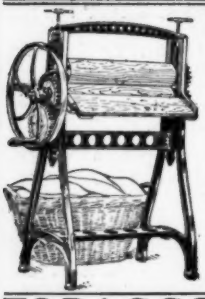

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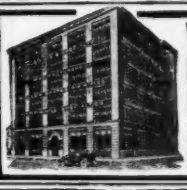

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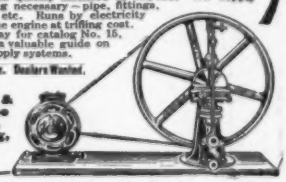

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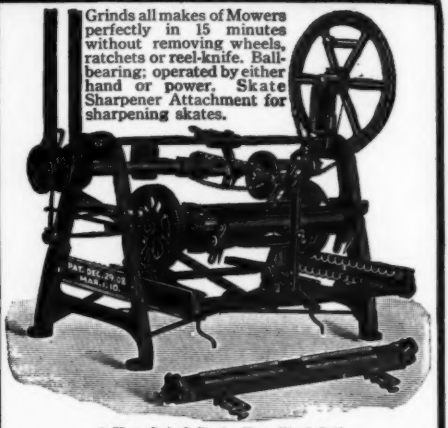

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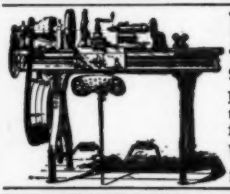

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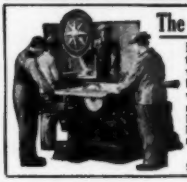

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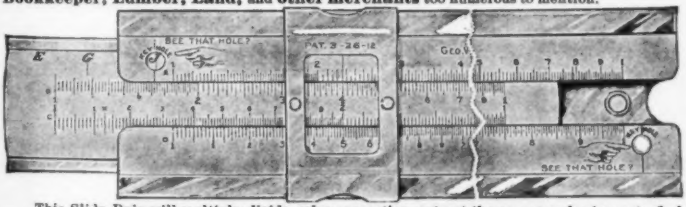

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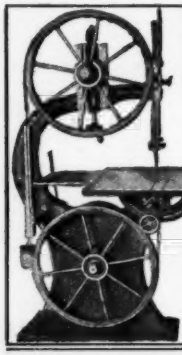

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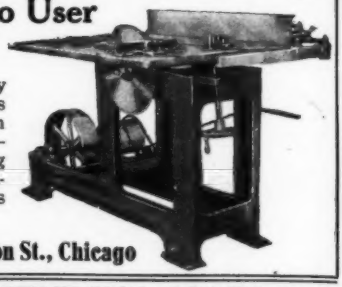

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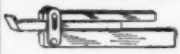

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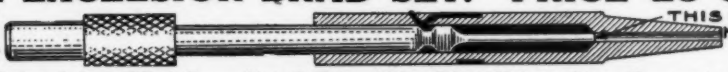

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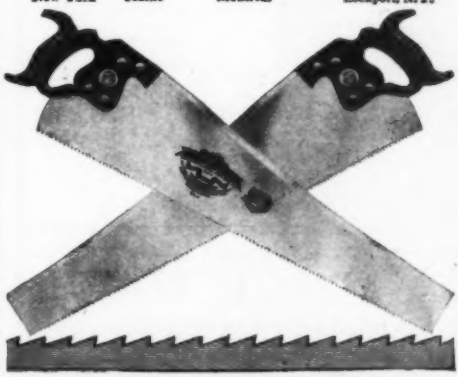

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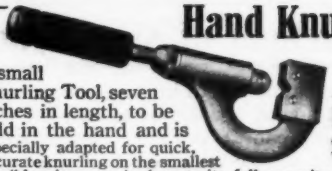

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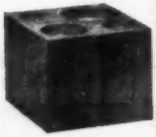

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covetous eyes on it. Bolts and screws and other portable trifles began to vanish. A few prosecutions were instituted, but the charges were withdrawn. Nobody seemed to care. The thieves, thus encouraged, grew bolder. Farmers brought their carts and horses and loaded them with spoil of rails, sleepers, switches, and signals. One station vanished to its last brick and door in a single night, and the work of spoliation went on until not as much as a plank was left.—New York Press.

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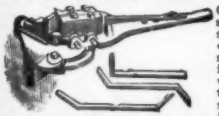

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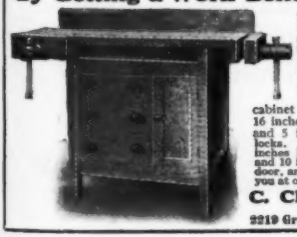

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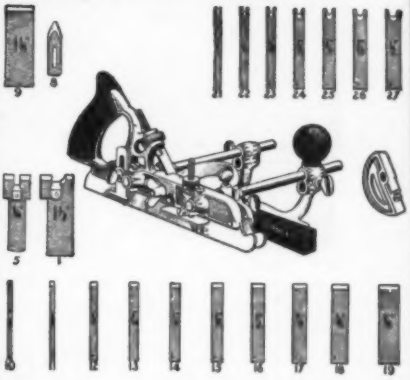

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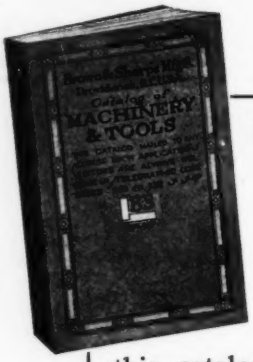

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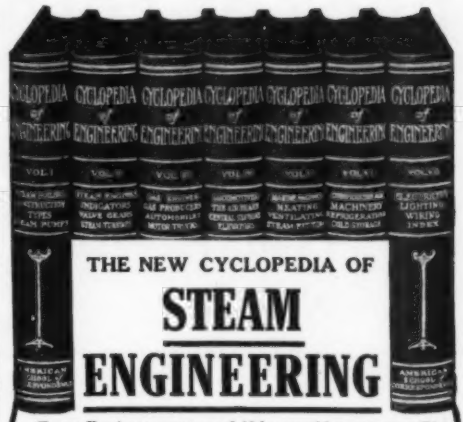

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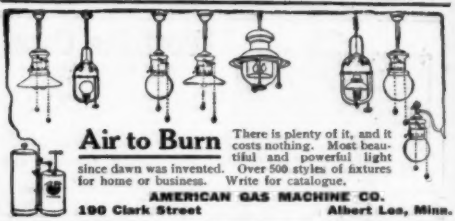

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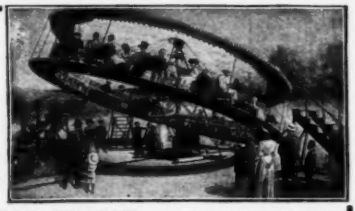

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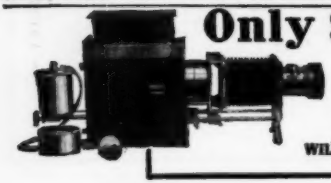

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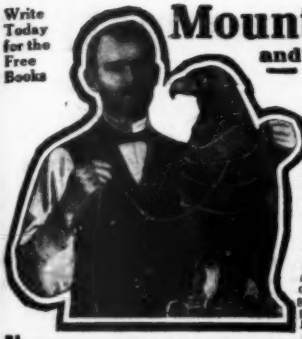

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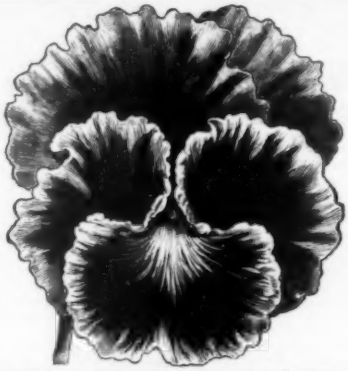

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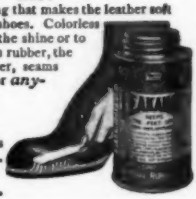

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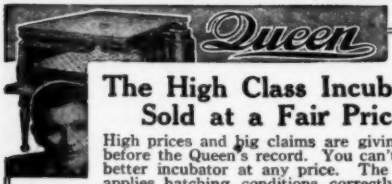

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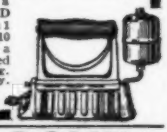

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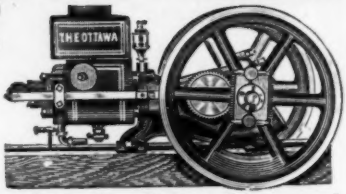

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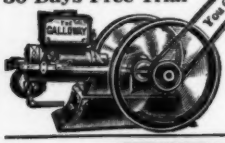

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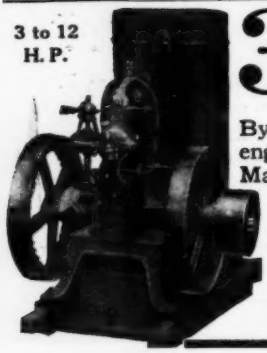

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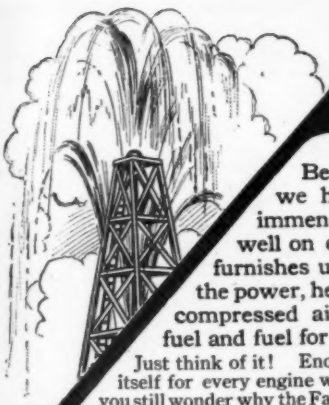

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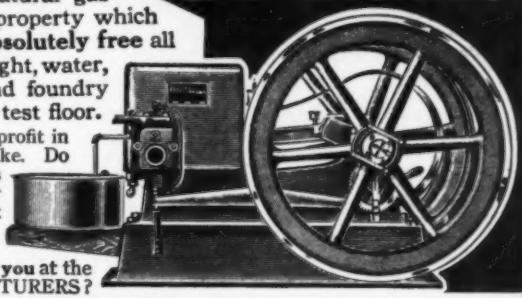

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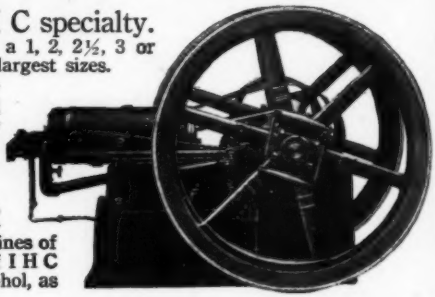

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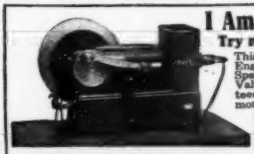

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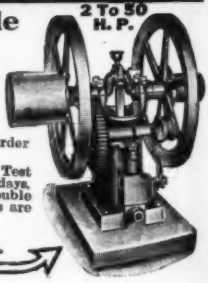

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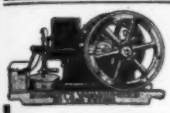

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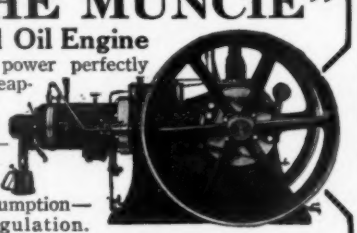

Muncie Gas Engine & Supply Co.
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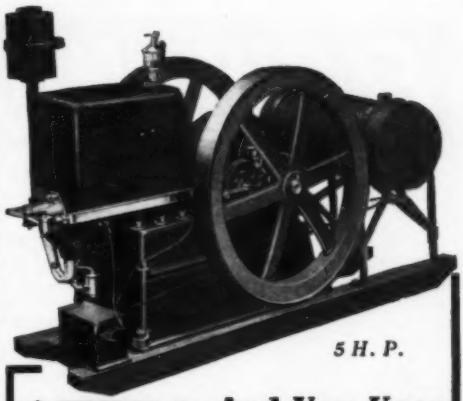

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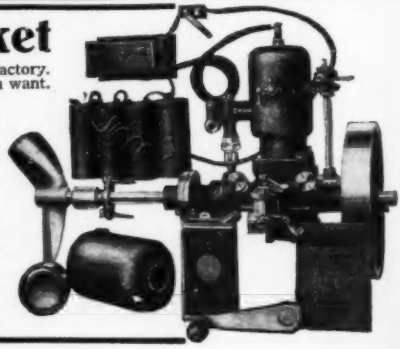

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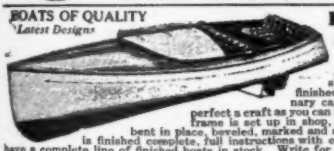

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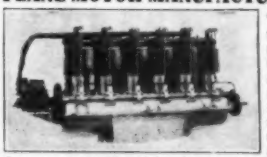

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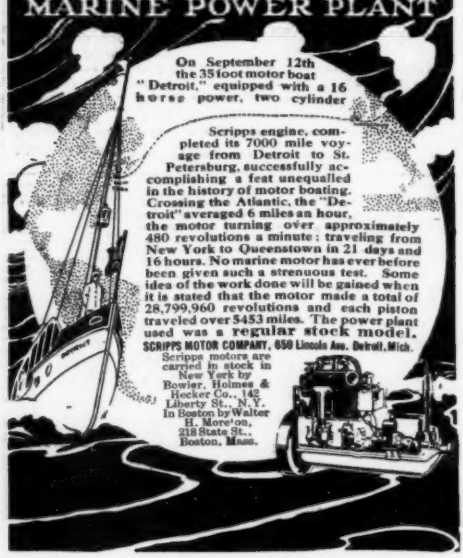

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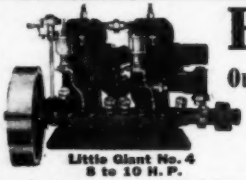

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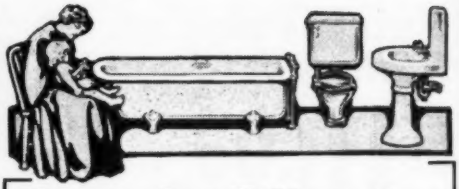

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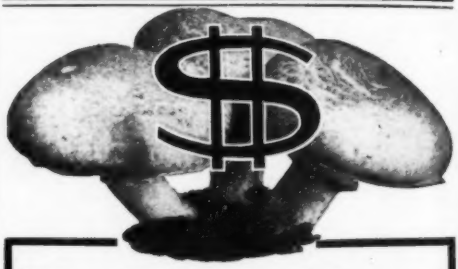

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Biggest, quickest, surest and easiest money-maker is growing mushrooms. Bigger money is being made in mushrooms now than ever before, by those who are today putting in practice the great revolutionary improvement in mushroom culture explained in our new book, "The Truth About Mushrooms." Open your eyes to an opportunity you never realized. No matter what your occupation or location, you can now

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Over 36,000 women save half on their dressmaking bills by using the **American System of Dressmaking.** It will teach you how to **Design, Draft, Cut, Fit, Make, Drape** and **Trim** any garment, including children's clothing—and save more than half what dressmakers and ladies' tailors charge. This means that you can dress far better—that you can use better materials—wear clothes that fit better; that feel better; that wear better, and you can have two garments for the price that one costs you now.

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Be first to enter this new big paying business in your town. Open your pockets. Let the dollars pour in. Act quick. Every auto sold means more tires to mend. Automobile business is growing fast—enormous field for tire repairing. Punctures and blowouts are common. Tires need retreading and vulcanizing. Something going wrong all the time. Thousands forced to buy new tires because they can't get old ones fixed. Think of the old bicycle days—repair shops on every corner—all making money—busy day and night. Autos make same proposition over again—only ten times bigger and better. Users of Haywood Tire Repair Plants are making big money. Johnson, Tex., writes: **"I made as high as $18 profit in a day."** Another man who bought a plant September, 1911, writes he has **cleared over $3000.00.** That's going some! Operate a plant as side line in connection with auto business—garage or as an independent business. Find neighborhood where there's a bunch of autos—get all the steady business besides transient work. Experience unnecessary. You learn quick. Simply follow directions—practice a few days on a couple of old tires and you'll be ready to coin money. Business comes fast and easy.

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Side Cars two parts. Four models to choose from. Send for Catalogue and terms. **$65.00 UP**

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WE will make you a long-time loan—you will have 20 years to pay for the land and repay the loan—you can move on the land at once—and your Canadian farm will **make you independent.**

This offer is directed only to men who will actually occupy or improve the land.

Why not go where you can own 10 acres for every acre you own or farm here; where **every** acre will produce **double** what a worn-out acre produces anywhere?

Not on the face of Mother Earth can you find better land than this rich virgin Canadian soil. The enormous crop yield per acre **proves** this every season.

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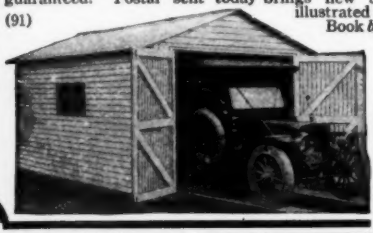

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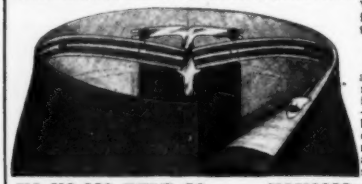

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We will save you 30 to 60 per cent on a modern steam or hot water heating system, complete in every detail.

Free Book Our catalogue illustrates and describes heating plants, bathroom outfits, pneumatic water supply systems, and everything in heating and plumbing line at wholesale prices. SEND FOR IT TODAY.

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DIAMONDS WATCHES JEWELRY
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I SMASH THE TERMS

Fine, White, Perfect Diamonds in Solid Gold, 14 Karat, Latest Style Mountings. No matter where you live **YOUR CREDIT IS GOOD.** Lower prices than all cash houses. Send name and address for **guarantee and easy payment plan.**

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of this migratory habit. When the heat grows too intense for comfort the whole town packs up and, driving the herds of yaks, sheep and goats, moves up to the higher altitude and the traders from India at once begin to drift in.

GET ON THE VAUDEVILLE STAGE

I tell you how! Fascinating profession for either sex. Big salaries. Experience unnecessary. Splendid engagements always waiting. Opportunity for travel. Theatrical agents and authorities endorse my methods. Thirty years' experience as manager and performer. Illustrated book **"All About Vaudeville"** absolutely **FREE.** Send me your name and address **TODAY.**
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THIS GUN FREE

You can carry a gun, if it is this attractive WATCH FOB. Just like illustration. Exact miniature of Cowboy Six-shooter. Metal Gun, in Leather Holster, reminiscent of the Gun-carrying days of the West. Made within gunshot of the famous "Alamo" cradle of Texas Liberty.

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To introduce our great Southwestern magazine, brimful of good red-blooded stories, typical of the West, we offer a year's subscription (regular price $1.00) for 35 cents, and we will send you one of these handsome Pistol Fobs FREE.
Send 35c (coin or stamps) today, to

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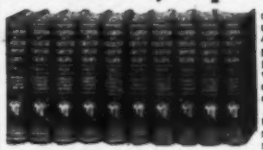
FREE to Carpenters, Contractors and Builders

This big, new Plan Book, **Modern American Homes**, containing hundreds of valuable suggestions, besides 108 plates with complete plans for every style of house, from the medium priced cottage to the most palatial suburban and city residence; also a large variety of apartment buildings, libraries, churches and institutional buildings, tent houses, garages, boat houses—the best in modern architecture by the greatest American Architects. This book of plans is 9⅝x13 in., printed on special paper and substantially bound.

THE CYCLOPEDIA OF

Architecture, Carpentry and Building



consists of ten massive volumes; 4,760 pages, 7x10 in.; 4,000 illustrations, full page plates, building plans, diagrams, etc.; hundreds of valuable tables and formulas; carefully cross-indexed for quick, easy reference.

This work covers everything in the building professions, from the first rough sketch of the architect to the acceptance of the finished structure. It includes wood, stone, steel, and reinforced concrete construction; estimating and contracting; a study of the Greek and Roman Orders; interior finishing and decorating; and modern house lighting and sanitation.

Partial Table of Contents

Mechanical, Freehand, Perspective and Architectural Drawing, Lettering, Pen and Ink Rendering, The Orders, Superintendence, Strength of Materials, Masonry, Reinforced Concrete, Carpentry, Steel Square, Stair-Building, Hardware, Steel Construction, Roof Trusses, Practical Problems, Estimating, Contracts, Specifications, Building Law, Sanitation, Sheet Metal Work, Electric Wiring and Lighting.

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With every order for a Cyclopedia we will include the Plan Book, absolutely **free of charge** and send you the Cyclopedia and the Plan Book, **express prepaid, for seven days' free examination.** You keep the books a full week—examine them thoroughly at your leisure—and if they don't meet with your expectations they may be returned at our expense. Remember—the complete set, Cyclopedia and Plan Book, are sent **free** upon receipt of the coupon below and we pay express charges both ways if they are not satisfactory.

Another Free Offer With each set is included a year's Consulting Membership, regular value $24.00, entitling you to the free advice of a corps of Expert Architects. This will give practical help in handling building problems which are too specific to be taken up in detail in the Cyclopedia. This service alone is worth more than the first cost of the books.

American School of Correspondence, Chicago, U. S. A.

FREE PLAN BOOK COUPON

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Please send **Free Plan Book**, also Cyclopedia of Architecture, Carpentry and Building for seven days' examination. I will send $2.00 within seven days and $2.00 a month until I have paid $24.80 for Cyclopedia (**Plan Book included free**), or notify you and hold books subject to your order. Title not to pass until fully paid. Pop. Mech. 2-13

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We have supplied 30,000 American Homes with "Come-Packt" Furniture.

It takes six minutes to drive these six screws. Now, if your time is worth more than **$2.21** a minute don't read any further. This advertisement is for those who want high grade furniture at rock bottom prices, who **love** beautiful things in the home, who appreciate choice designs, know solid worth, and approve of a selling plan that saves them fully one-half store prices.

COME-PACKT Sectional Furniture is such furniture. Take this table, for example. It is Quarter Sawn White Oak, with rich, deep natural markings, honestly made, beautifully finished to your order, in your choice of eight finishes. Measure out its dimensions with a tape measure — compare it with any piece equally good, at any dealer's It saves you more than one-half.

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Dealer's price, $25.00

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How! By coming to you in five sections, packed in a compact crate, shipped at knock-down rates. **Come-Packt** keeps no men on the road, has no stores, no dealers. You save all these big savings — freight, traveling men's and dealers' expenses and profits—a total of one-half **or more. With a screw driver and six minutes, you buy a $25 table for $11.75.**

Honest furniture and an honest selling plan, as thousands have proved. Our free catalog — the most beautiful furniture book ever given away—tells all the details, gives you a choice of more than 400 pieces, and color plates show the exquisite finish and upholstering.

Write for this beautiful big book today. Mailed free.

Come-Packt Furniture Co. "COME-PACKT" SECTIONAL FURNITURE **201 Fernwood Avenue TOLEDO, OHIO**

Come-Packt Sectional Furniture is not handled by dealers. You buy at factory prices.

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This is a recent picture of the man who made $1500 in one month with a Long Crispette machine, in a store window.

You might just as well make as much. Perrine, Cal., **took in $380 in one day.** Every nickel brought almost 4 cents profit. Start in this safe, profitable and fascinating business. Best season just at hand. You can make lots of money this winter and next summer. Get a good location where lots of people pass and the money should come in bunches. **Crispettes are fine**—different in shape, taste and quality. Everybody—young and old craves them. Sell for 5c a package—popular price—easy to get money. Think of fortunes made in five cent propositions—then figure what you can do. **Write me today.** Get full particulars—reports from others. Act upon the prompting you have—**now**—

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so you may find out what a wonderful entertainer it is before sending me one cent for it.

Then when you've decided to buy it I will make the terms of payment so light that you'll hardly realize you're paying for it. You don't have to promise to buy and you don't have to send me one cent of money to borrow this machine. Send for

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The Victor carries right into your home the world's most famous singers, bands, orchestras, pianists, violinists, elocutionists, speakers, comedians—people you would pay many dollars to hear *if* you could even get to hear them. Do not compare the Victor or the Victrola with the old machines of any other kind—reproduction of sound is perfect and clear without squeak or whir.

Now, ***write me to-day*** for catalogs of Victors, Victrolas, and records and complete information about my free trial offer and ***easy payment plan.***

Special Outfit Proposition

to the *first 100 persons writing in reply to this advertisement.* Give date and time when writing.

PETER GOODWIN, Pres. Goodwin Merc. Co.
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Get this Pen Knife Sharpener—FREE

and forget the annoyance of dull pocket knives, office erasers, etc. It's a genuine Pike India Stone —one of the famous

PIKE SHARPENING STONES

"The only line that includes every sharpening substance — natural or artificial — each the best for some sharpening need."

Pike India is the only stone in existence with crystals of sufficient hardness, toughness, and sharpness to quickly cut the hardest tool steel without grooving. No stone which cuts so fast wears down so slowly—hence its economy. Dropping it won't break it, and if properly oiled it will not glaze. Made in various shapes and sizes and in coarse, medium and fine grits. The best shape for all general tool sharpening about the shop and home is the Pike India Combination Oilstone (one side coarse, the other fine). Size 7x2x1 and price $1.00 at your hardware dealers.

Let us mail you this Pike India Pen Knife Sharpener. Merely send your dealer's name and four cents for packing and mailing. We'll include "How to Sharpen"—greatest little book ever written on sharpening and how to select and care for oilstones. You'll be pleased. Write today.

PIKE MANUFACTURING CO.
101 Main St. PIKE, N. H.

Be a Manufacturer of Pressed Cement Brick and Blocks

This is the greatest opportunity in America today and open to you right in your own community. Pressed brick and blocks are just as staple as the clothes on your back or the bread you eat. Think of it—a billion brick used annually in the U. S. And blocks are just as necessary. Millions in actual profit are made annually out of these products.

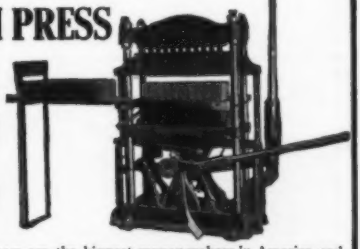
There Are Big Contracts with Their Big Profits Ready for You

No matter where you are, how little the town or how big the city. Builders are turning to this product because it solves the problem of high cost of building. Concrete must take the place of wood, stone and clay. Here are experiences which you can duplicate in your community:

I landed a $90,000 government contract with Helm pressed cement brick.
Just landed a contract for 400,000 Helm pressed cement brick.
We are working on a contract for a half million pressed cement brick.
Made a million brick this season on one of your Helm presses.
My daily manufacturing profits on pressed cement blocks average $25.
Working on a contract for a quarter of a million pressed cement brick.
Made 17,000 pressed blocks for one contract in less than a month.
Six weeks behind on Helm pressed cement brick and block orders.

We want you to know more about these manufacturers who are landing the big business and making the big money. We want to show you how they started with but little capital. Then you will see how easy it is for you to start.

All You Need Is This HELM PRESS



It Will Earn You $20 to $50 Daily

Factory owners are the biggest money makers in America and this machine will place you in their ranks. You can start with little capital and even without experience. This is the machine for you because it makes pressed cement brick and blocks under **80,000 POUNDS PRESSURE.** No tamping, and easy work. It makes 1,000 blocks or 10,000 brick daily. No burning required. Ready for the market in a few days' time. Eventually someone will make pressed cement brick and blocks in your community, but now the opportunity is yours. No matter if cement products are now made there—these brick and blocks made by pressure will be demanded. They are necessary for the

Helm DRY WALL Building System

This is the system which appeals to builders, contractors and architects. It overcomes the opposition to concrete because it offers absolutely **DRY WALL construction.** It saves money for builders, as **no furring and lathing are required,** and it makes **rigid walls** and **fireproof walls.** This is the system which is bound to get you business and give you the advantage over all other products.

Send for This FREE CONCRETE BOOK

Tear off the corner coupon right now before you turn the page. Let this free book tell you all about this great opportunity which is open to you today. It will tell you all the details of this system, about the Helm Press and the DRY WALL building system. It will show you how easy it is to start a profitable business. It tells how each product is made, how it is cured and sold. Write today. Do it now.

Queen City Brick Machine Co.
522 Bank Bldg.
Traverse City, Michigan

Queen City Brick Machine Co.,
522 Bank Bldg.,
Traverse City, Mich.

Please send FREE the book on concrete and Helm Presses.

Name.....

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Address.....

Continued from Page 36 Front Advertising Section

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SIDNEY wood-worker $115. Four hp. stationary gasoline engine $55. Split wood pulley 24"x10" $5. F. O. B. Plymouth, Ind. Geo. H. Cappel.

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TEXAS—Farms, ranches, colonization tracts, 10 to 150,000 acres, $2.00 up; terms; send for list; hundred bargains. F. G. Van Valkenburgh, Drawer 1069, Dallas, Texas.

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BEST Extension Ladder at factory prices. Write to John J. Potter, 14 Mill St., Binghamton, N. Y.

GREAT Dane Dogs. Send for list. E. H. Hillyard, Dubuque, Iowa. Slumberland Place.

I WILL start you in the mail order business if you will handle my goods. Crest Company 50, Atlantic City, N. J.

LEARN how to make $3.00 to $5.00 a day after your day's work sharpening Lawn Mowers. My instructions for $1 give three different ways to sharpen them, also how to get the work. O. C. Sailors, Taylorville, Ill.

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BARGAINS in 6, 18 and 24 hp. Marine Engines. Hardly used. J. R. Collette, 900 S. Wabash Avenue, Chicago, Ill.

WE buy, sell and exchange. Bargains in Microscopes, Telescopes, Binoculars, Cameras, etc. Bargain list sent. Kahn & Son, Opticians, No. 54 John St., New York. Established 62 years.

AGENTS wanted for the newest patented household specialty. Every home wants it. Biggest seller ever offered to agents. Sample free. Schenk, Kaurene & Co., 511 N. 6th St., Philadelphia, Pa.

ATTENTION—Wonderful machine, merges one pint of milk into one pound of butter in two minutes; write for names and address of five hundred home users, sworn testimonials, illustrated circulars and agents credit terms. Family Butter Merger Co., Washington, D. C.

VALUABLE patents secured. Millions of dollars made with inventions. Book "C" and useful information free to inventors. Prompt, confidential, expert service guaranteed. Lester L. Sargent, patent lawyer, 718 12th Street, N. W., Washington, D. C.

YOUR Invention—We advise both concerning mechanical features and patents. Advice on each better because of our knowledge of the other. Advice not free but may save you money free adviser would have you spend. Special machinery models, patents. Saturn Machine Company, Wheeling, West Virginia.

$2,000 MONTHLY to salesmen handling patented overflow concrete bridges, cheaper than steel bridges, builders profit 50%, profit from a single county $50,000, for particulars write Chas. Horton, inventor, Belle Rive, Ill.

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FOR Sale—Four cylinder Premier air cooled engine, planetary transmission, front axle, back axle, steering gear, four full elliptic springs. Rodefeld Mfg. Co., Richmond, Ind.

MAKE money writing short stories. Big pay. Free booklet tells how. United Press Syndicate, San Francisco.

AGENTS—Salesmen. We are the originators of the natural blend, fragrant, mild cigars sold direct to the smoker. Send $1.25 for sample box of 25 with terms, etc. Smoke House Jim, Jonesboro, Ark. Box 641, Dept. 40.

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MAIL Order Business in its true light and particulars showing how you can obtain a loan of advertised mail order instructions and "schemes," sent free on request. Library Division 37, The Mail Order News, Fishkill, N. Y.

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A Piedmont Southern Red Cedar Chest placed in your home on 15 days' free trial. Freight prepaid. Protect furs and woolens from moths, mice, dust and damp. Low factory prices enable every home to have useful and beautiful Piedmont Chest. Write for big 56-page illustrated catalog showing all beautiful designs and amazing low prices. Also book, "Story of Red Cedar." All postpaid, FREE.

Piedmont Red Cedar Chest Co., Dept. 99 Statesville, N. C.

Learn the new profession Tree Surgery

Not overcrowded and offers splendid and unusual opportunities to honorable young men. Ages 20 to 28. Students must have attended high school, and be at least 5 foot 7 in height, physically sound and of good character. After completing two years' course, good men make $1,000 to $5,000 a year. Positions guaranteed to good men after graduation. Every city, park, orchard and private estate needs an Expert Tree Surgeon. Positions open also with established companies or State and National Governments. Special attention to Fruit Growing. Tuition moderate, including first year's board. We pay salary second year. Write promptly for full particulars. Address the Secretary.

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Bicycles 50% Off

Factory Price until we close a retail dealer in your community. When retail dealer in your community takes hold of "America" line this offer positively ceases. Order **at once** and save **HALF.**

Famous "America" Wheels

Not "cheap" mail-order wheels. Not sold in a "cheap" mail-order way. Only wheel with Truss Frame, giving double strength, and Hygienia Spring Fork, taking up every shock. Comes complete. **GUARANTEED TEN YEARS** (twice the guaranty of any other wheel). Protection from thieves—protection from accidents. Satisfaction or money back.

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You will never know half the delights of motor boating until you install a **Baldridge Reverse Gear.** Makes you master of your boat, for by simply moving a single lever, you can stop, go ahead, or reverse your boat's motion almost instantly. **Engine does not stop**—full power always available.

Quickly pays for itself by preventing collisions in docking, and in emergencies. Praised in highest terms by thousands of users. Don't use or buy a boat without a "Baldridge."

If not at your dealer's, send for FREE BOOK

If you are in the boat business, write for our dealers' proposition. Some good territory still open.

THE BALDRIDGE GEAR CO.,
692 W. Grand Blvd., Detroit, Mich.

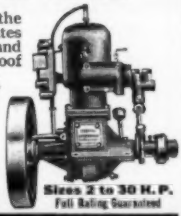
1913 CAILLE PERFECTION

Here's the Achievement of a Mechanical Ideal, the success of which guarantees an Efficient motor boat, in that it permits the conservation of your motive power.

Power when and where you want it—real full rated horse-power harnessed into one complete, accurately balanced power unit—straight line drive transmission system and a drive shaft that is all twist, all energy, all leak-proof—that's the Caille Perfection Marine Engine for 1913. A triumph of engineering skill that has excited the wonder and admiration of the entire engineering profession.

This Engine 100% Right The Sensation of 1912

The Caille Perfection Igniter was the sensation of 1912. The Igniter obviates the use of magneto, timer, batteries and coils and insures you a trouble-proof engine. This Igniter equipment is embodied in the 1913 Caille—why not get the free catalog for complete details and description.



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1207 Caille St., Detroit, Michigan

Diamonds on Credit
20% Down; 10% a Month
Every customer is protected by our written guarantee to refund his money if his dealer can duplicate our diamond at our price.
Write for Illustrated Catalog No. 3.
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Amazing Profits In Mushrooms
Anybody can add $8 to $40 per week to their income, in spare time, entire year growing mushrooms in cellars, sheds, barns, boxes, etc. I tell you where to sell, at highest prices.
Free Illustrated Instruction Booklet
HIRAM BARTON
Desk 2, 329 W. 48th St., New York

GUARANTEED FOR LIFE
30 DAYS' FREE TRIAL

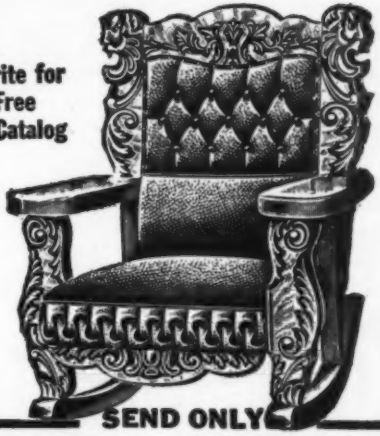
AMERICAN MARINE MOTORS

$38.00
2 H. P.

Simplicity, efficiency and **reliability** are some of the superior qualities of the AMERICAN, and are of vital importance to **you.** Starts without cranking, reversible, runs on gasoline, kerosene and other fuel, very economical. All sizes 2 to 30 H. P. Lowest possible Prices. Write for new FREE Catalog. **Good Demonstrator Agents** and **Boat Builders** write quick for special term and sales plan. We also build stationary engines—ask for circulars.

AMERICAN ENGINE CO., 456 Boston St., Detroit, Mich.

Write for Free Catalog



SEND ONLY 50c and We Ship You This Superb Rocker!

Yes, only 50c and we ship you this magnificent Rocker. Only 50c down and then 50c per month—$3.95 in all for this handsome piece of furniture. **Positively the greatest bargain ever offered here or at any other place.** Write for free catalog and bargain list today. We defy any house in America to equal our stupendous offers. You can see for yourself what an elegant rocker this is. It is made in American Quarter-sawed oak finish. Has high back. Handsomely upholstered. Profusely carved back and front posts. Upholstering throughout in best grade of Boston leather—diamond tufted. Padded seat with good quality coil steel springs.
Order by **No. A 1264.** This rocker is only one of the special bargains we are now giving. Send for this bargain list today.

Easy Payments

The great house of Straus and Schram, with a proud quarter century record, **endorsed by the greatest bank,** will trust you and allow you to buy any article on easiest monthly payments. If you want anything in rockers, chairs, bedsteads, carpets, rugs, curtains, washing machines, crockery, silverware, baby carriages, go-carts, Men's, Women's and Children's Apparel, stoves, ranges, or any other article of housefurnishings, don't fail to get our sensational terms.

FREE Special Bargain List and Catalogs

Don't wait a minute before sending for our great bargain catalog and special monthly bargain list. Bargains which are positively astounding; bargains which simply cannot be met by our competitors because of our stupendous buying and manufacturing facilities.

Write Today, Don't Wait
Send the free coupon, a postal or letter—but send right now. Take advantage of these special offers while they last. **This month only.** So hurry. Just your name and address on postal or letter and we will mail, free and postpaid, our catalog and bargain list.

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35th St.,
CHICAGO

FREE COUPON
STRAUS & SCHRAM (Inc.)
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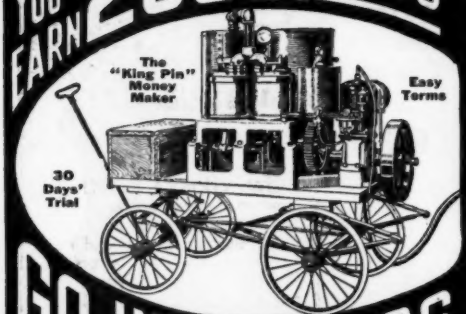
☐ Men's Clothing ☐ Ladies' Clothing

My name is.....
My address is..... 701
If you would like to have the rocker shipped at once send only 50 cents.

YOU EARN $2500.00 TO $3000.00 PER YEAR



GO IN BUSINESS FOR YOURSELF

Realize your ambitions! Grip success. Be a business man! Earn **$2,500.00 to $3,000.00 per year net**—even more is possible. Here's a wonderful opportunity to make an easy start. Send for one of our money making **B. B. Vacuum Cleaners** on

30 Days' Trial

Try out the proposition 30 days—see how much there is in it. It's a great chance to start business for yourself—just what you've been wanting to do—the very opening you've been looking for. One of the most wonderful money making propositions ever invented.

Tremendous Profits

The headline is conservative. **$15 to $30** a day should be easily made. Some work three machines—operate one themselves—hire men to work the others. They make big profits from others labor. Maybe that's what someone is doing to you. You're doing the work for small pay. He's getting the profits. Change that. **Work for yourself.** Get **all** the profits. Be independent.

Big Demand For Professional Vacuum Cleaners

You should get lots of business. Every home has to be repeatedly cleaned. Everybody now wants vacuum cleaning. It's the new, easier, better way of cleaning. Nobody wants to tear up carpets and rugs and pound them to pieces. There's a big demand for the man who can clean the whole house—rugs, mattings, carpets, mattresses, pillows, portieres, curtains, upholstered furniture, etc., —do the whole job in a few hours without turning the house upside down. One man can clean ordinary home in four hours.

One woman engages you—then next door neighbor wants you. So it goes. Think of the homes that need cleaning—think of churches, halls, lodge rooms, hotels, etc. that need cleaning—extra big jobs and extra big money.

You should be busy as a bee.

Powerful Proof

Must say that the B. B. machine has given perfect satisfaction. The second day after it arrived we cleared $22.00.
Montgomery & Porter, Mo.

Your favor of the 3rd inst. received, The B. B. does all you claim. It will knock out from $20 to $25 in six hours easy.
A. O. Rainbow, Mexico.

I started out with my machine on March 12, and up to the present time, June 6, have made $556.60. I will need another machine next season. C. H. Otting, Ky.

It is the greatest dirt puller I ever saw. I can make $20 a day with it which I think is good for the investment. My customers are well pleased with my work. I have three or four regular customers by the month. A. W. Staley, Ill.

FREE BOOK SEND FOR IT

Work is easy and fascinating. Always a crowd around your machine. They advertise you. You get phone calls—business—business—business—all the time. When money is earned—it's **yours—all of it.**

Let Your Profits Pay For Machine

We sell for cash or on installments. You should earn money from first day. **When payment comes due, pay it out of your profits.**

The B. B. Vacuum Cleaner is a wonder—simple—reliable—complete. We are glad to send it on **30 days' trial.** We know it will make good.

Our 1913 B. B. Machine consists of a powerful gasoline two-cycle, valveless engine, perfectly adjusted and inspected. It has all the latest attachments and improvements of best quality—made to last and complete in every way. **Protected by Kenney basic patents.**

The whole is erected upon a substantial four-wheeled wagon—steel or rubber tires—full elliptic springs—staggered steel spokes—strong and substantial, yet so compact and light it can be moved from place to place with little effort. Equipped with vacuum condenser, water tank, vacuum gauge—high pressure suction hose—observation glass and cleaning tools all properly connected and adjusted ready for work. All fittings best on the market. Simplest and easiest working Vacuum Cleaner proposition ever set up. All our users praise it. Say it is the best ever.

Send today for free book and full particulars regarding our 30 days' trial. A 2-cent stamp brings it. We tell you how to start—how to get business and make a success. Vacuum cleaning is new—something everybody wants and can afford. It's a tremendous money maker. Now is the time to start. Answer this announcement **now.** Be ready for the spring rush. **Remember you might just as well make $2500 to $3000 or more this year.**

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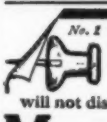

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Other cleaning devices come and go, but the Bissell Sweeper withstands all competition, always emerging with increased prestige and a broader measure of public favor. The reasons for this are very plain and simple. The Bissell Sweeper occupies a distinct field of usefulness that no other cleaning device covers, meeting a daily necessity of every home that cannot be practically compassed by expensive cleaning machines that are cumbersome to use; and beyond this, the "Bissell" gathers up miscellaneous litter that other devices cannot pick up—all of which is recognized by housewives generally. The dirt and dust problem has to be met every day in the year, not periodically; and the Bissell Sweeper is the only cleaning device which, on account of its lightness and efficiency, is practicable to use daily. The very latest BALL-BEARING BISSELL costs but $2.75 to $5.75, and will last from five to fifteen years, according to care given it.

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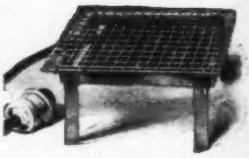

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28x3	$ 7.50	32x3½	$ 13.00	34x4	$18.75
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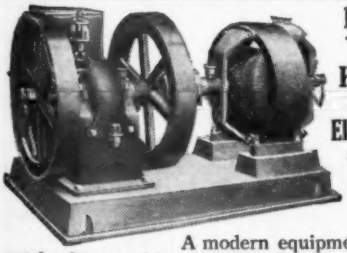

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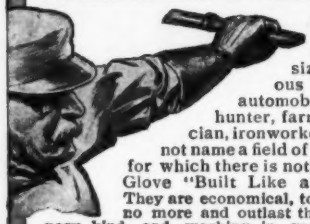

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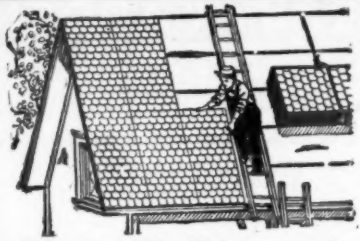

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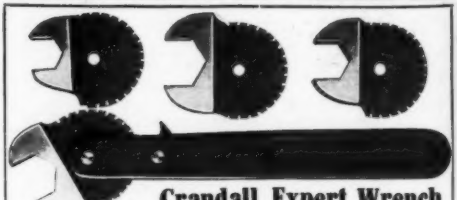

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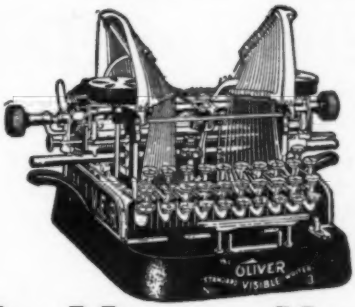

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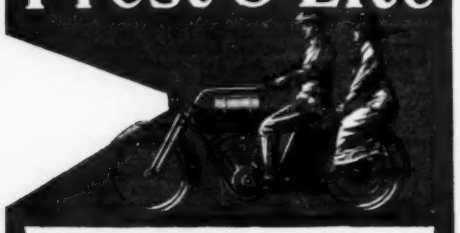

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Mr. Park's life work has been poultry and the production of poultry feeds (endorsed by Gov't Experimental Stations). The book is in calendar form—illustrated in a charmingly whimsical way. Each picture a practical lesson and there is a wide margin left for the owner's notes. In red burlap board binding $1.00 postpaid on receipt of price. Money refunded if you want it.

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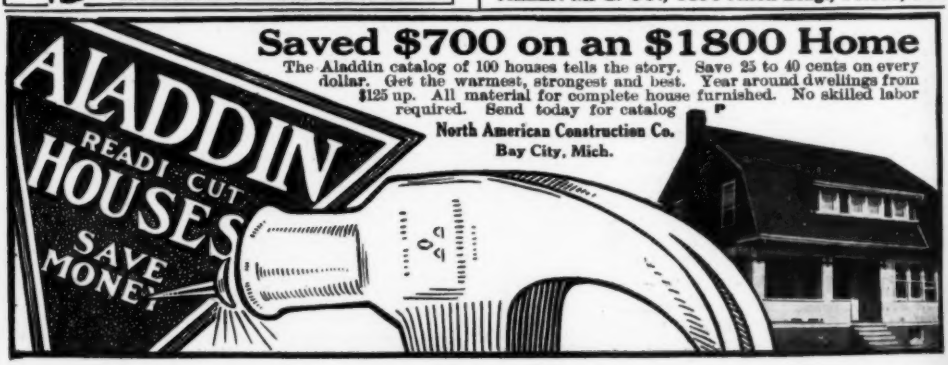

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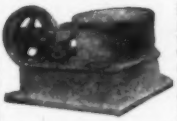

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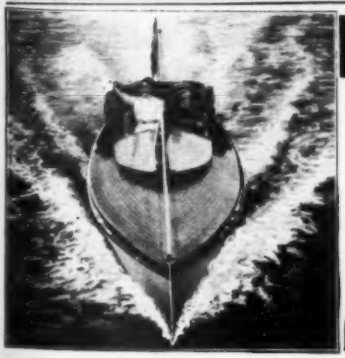

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Facing The Future Fearlessly

By FRANKLIN O. KING

"Ring Out the Old; Ring In the New. Ring Out the False; Ring in the True." It Rings in Your Ears, and Well it May. Tennyson never Wrote a More Beautiful Poem, and You never Read a More Helpful One. Read It Over Again. Every Man should Strike a Balance on New Year's Morning, even Though He May Have Been a little Off his Balance New Year's Eve. It's Easy to Turn Over a New Leaf, but It Takes a Real Man to Keep it Turned. "Eternal Vigilance" is the Price, not Only of Liberty, but of Habits, Health and Happiness —Now and Hereafter. Good RESOLUTIONS will Become REALIZATIONS **only** when Backed up By PERSISTENT PURPOSE.

How about Your Balance Sheet for 1912? Haven't You charged off a Lot of Things to "PROFIT and LOSS" that Ought to Be On the Credit Side of the Ledger? Haven't You Frittered away a Great Deal of Your Hard Earned Cash for Petty Pleasures, or Lavish Luxuries, when You Could Have Laid By Something for the Inevitable "RAINY DAY?" How Much Better Off are You than Last Year, or the Year before That? True, You have "Kept the Wolf from the Door," but by a Little Economy and Self-Denial You Might have Begun the Erection of a Fortification that would Forever Free your Family From Fear of Its Ferocious Fangs.

Two Texas Gulf Coast Products

Your Good Job may not Always Last. Some of These Days a Younger Man May Fill Your Place. I said a "Younger," not a **Better** Man. The Gray is Creeping into Your Hair, and the BOSS is Likely to Forget the Splendid Things You Did—Once Upon a Time. "Yo' Ben a Good Old Wagon, But Yo' Dun Broke Down." The World Wants a WINNER, and Won't Worry Along With Wornout Workers.

"Parted From the Pay Roll" is a Little Drama in which You may Expect to Play the Principal Part Some Sad Saturday, P. M. Then the "Good Fellows" who Helped You Spend Your Money Will Likely Pass By on the Other Side, and the Only Place You can Look for **Sympathy** will be In the Dictionary.

Let US, therefore, "Ring Out False Pride," and Hereby Firmly Resolve to Establish a New Record for 1913, which Will Enable You to FACE the FUTURE FEARLESSLY. Strikes, Lockouts, Panics and Periods of Financial Depression **Cannot Depress You,** if You Will Make It a Rule to Save a Little Something Every Day. Again I Repeat It—**Saving** is the Antidote for **Slaving.**

The Best Incentive to Persistent and Systematic Saving is the Desire to Get a Home. The Best Place I Know of to Get a Home is in the Rain Belt of Gulf Coast Texas, where You can Grow Three Big Money-Making Crops a Year, and where Irrigation and Fertilization do Not Eat Up the Profits Your Hands Create.

I believe you could save Twenty-five Cents a Day if You tried. I know you would Try if you Realized that our Growers of Figs, Strawberries and Early Vegetables clear a net profit of $300 to $500 an Acre. Men have Realized more than $1,000 an Acre growing Oranges in our Country. Remember that our Early Vegetables get to Northern Markets in Mid-Winter and Early Spring, when they command Top Prices.

One German Truck Grower on adjoining lands this spring realized nearly $500 from three-fourths of an acre of Strawberries. You could do as well if you only Tried, and on a Ten-Acre Tract **Find Financial Freedom.**

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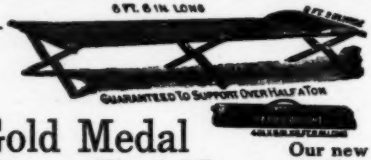

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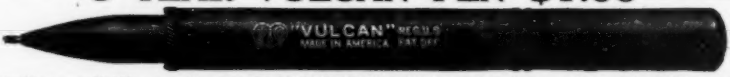

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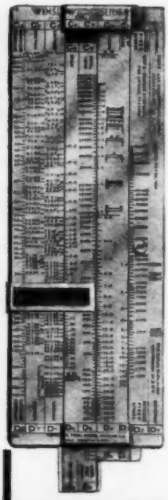

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Your Comfort Demands President Suspenders

Prove it for yourself today and you'll swear *by*, not *at* **SHIRLEY PRESIDENT SUSPENDERS**

Wear a pair for a month. If you don't like them we will buy them back at the price you paid

Light and medium weights. Extra lengths for tall men. Each pair guaranteed. **Price 50 Cents Everywhere**

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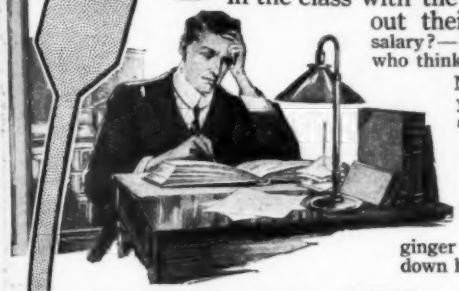

DOES this picture tell the true story of your daily life? Are you in the class with the thousands of city men who are grinding out their nerves and vitality at a mere clerk's salary?—or are you a silent member of that great army of men who think they should be satisfied with just "getting along?"

No matter which class you belong to—no matter what your living problems may be—there IS a way for you to **start over** and it is a way you can **reasonably afford!**

Others have done it and so can you.

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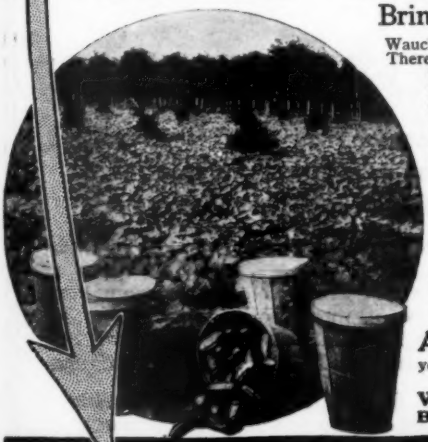
You can start fruit trees and let vegetables keep you going. They furnish your living expenses and pay for your land. And all the time your grape fruit trees and orange trees are developing.

Wauchula, Florida

A Place Where Your Present Effort Will Actually Bring You In Ten Times As Many Dollars



Wauchula, Florida, is God's country. There's sunshine, lots of it, there. There's fresh air, fine government, lakes, beautiful skies, and scenery—there's big fish, worth while game, swimming, boating—and best of all there's big Money to be made there. The right soil and right altitude grow finest grape fruit, oranges and citrus fruits in profusion.

We Give You a Whole Year to Decide—Is That Fair?

You are not rushed into anything here at Wauchula, Florida. All we ask you to do is to investigate this offer **now.** It is absolutely unlike any other in Florida. Bankers of established reputation guarantee the land. You can write them. If you are not satisfied absolutely beyond any question, we'll give you back your money, with 6% interest for the time we have had it. Hundreds of settlers here are prospering. So can you. They're making from $5,000 to $7,000 and $8,000 annually and more. You can do just as well. A 10-acre plot is big enough. A small first payment and then $1.00 per month per acre allows you "to pay as you go."

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WAUCHULA DEVELOPMENT COMPANY
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$5,000 a Year

Wauchula Development Co.,
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Please send me actual facts regarding your combination vegetables and citrus fruit lands. Also prices, letters from settlers, etc.

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7 H.P. Twin Cylinder has the reserve power that carries you at any pace over any road. Through deep mud and sand and up steep, rough hills. Wonderfully smooth running motor.

New Cradle Spring Frame, assures absolute comfort under all conditions. Equipped with recoil leaves and rubber bumpers. Positively no "bottom" to spring action. Normal working zone of 4 inches. Double scrolls at rear shackles, coming into action successively under light and heavy jolts. Hinged joint bracket has wide bearing surface, steel on steel. Oilers placed at all working points. Frame motion does not cramp chains.

¶ Foot boards with separate brake lever now fitted in addition to pedals. A host of new minor refinements besides makes the Indian Twin a rare example of mechanical perfection. *Free Engine Clutch* is a superb speed control device, giving the machine a thousand speeds. Ideal for city traffic.

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Wherever you ride you're always in Indian Territory. *No increase in prices over 1912 models.*

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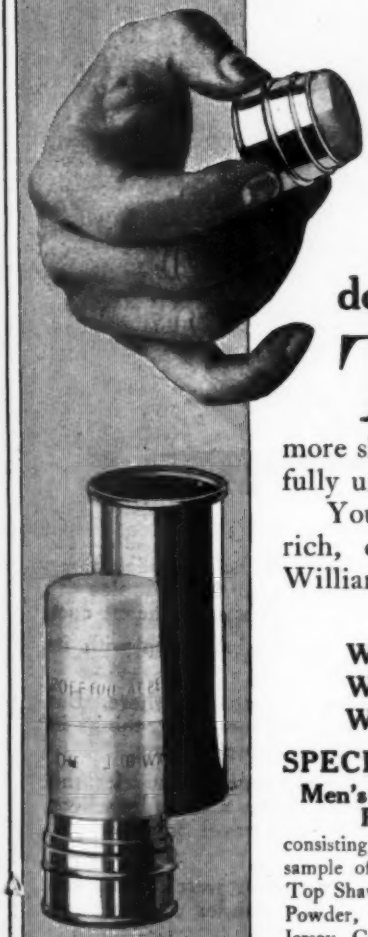
(BRANCHES AND SERVICE STATIONS)

Chicago Denver San Francisco Atlanta Toronto London, Eng.

Williams'

PATENTED Holder Top Shaving Stick



The Holder Top, the Shaving Soap and the Nickeled air-tight Case

Perfect shaving comfort down to the last bit of soap

THE Holder Top saves the soap you would otherwise throw away and cuts down the cost per shave by giving you more shaves per stick. Its convenience cannot be fully understood until you have used the stick.

You already know the Williams quality—the rich, creamy, emollient lather that has made Williams' Shaving Soap famous.

Three other forms of the same good quality:

Williams' Shaving Stick in the familiar Hinged-cover Nickeled box
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Williams' Shaving Cream (in tubes)

SPECIAL OFFER
Men's Combination Package

consisting of a liberal trial sample of Williams' Holder Top Shaving Stick, Shaving Powder, Shaving Cream, Jersey Cream Toilet Soap, Violet Talc Powder and Dental Cream. Postpaid for 24 cents in stamps.

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No money needed, no promises to make, or papers to sign. Use a Luther shop outfit 30 days absolutely free. Sharpen all your tools — test it every way—keep track of the time it saves you. Watch how all your work speeds up because your tools are keen.

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